DRAFT INTERIM REMEDIAL INVESTIGATION/FEASIBILITY STUDY
PERCHLORATE AND VOC IMPACTS TO GROUNDWATER

RIALTO, CALIFORNIA

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EXECUTIVE SUMMARY

This Draft Interim Remedial Investigation / Feasibility Study ("RI/FS") was completed to characterize impacts to groundwater upgradient of the City of Rialto Well No.3 (CR-3) and to evaluate alternative remedial response measures that might be employed to respond to this condition and assure that the City's water supply is not affected. Well CR-3 is located approximately 1.6 miles southeast of the former Rialto Ammunition Back-up Storage Point (RABSP) that was active during World War II and where a large portion of the munitions that were used in the Pacific theater of war were temporarily stored. After the war, many of the original bunkers and roads continued to be used for commercial and industrial purposes, with pre-existing RABSP roadways and munitions bunkers subsequently used for the manufacture, storage, transport, and disposal of explosives, fireworks, and other potentially hazardous substances. Records indicate that perchlorate and trichloroethene (TCE) may have been associated with many historical RABSP activities and these compounds are considered the primary threats to groundwater quality near well CR-3.

Property owned by the County of San Bernardino (hereafter the former "Bunker Area") adjacent to the northeast corner of the Mid-Valley Sanitary Landfill (MVSL) was historically part of the RABSP. Following detection of perchlorate at elevated concentrations in samples from monitoring wells located near the northeastern portion of the MVSL, the Regional Water Quality Control Board (RWQCB) directed the County to develop Work Plan(s) to investigate the nature and extent of the groundwater impacts. After receiving RWQCB approval of the Work Plans, the County completed three phases of field investigation that involved soil sampling in the former Bunker Area northeast of the MVSL and installation of 18 groundwater monitoring wells.

Evaluation of groundwater impacts involved the use of "temporary wells" to obtain water samples from discrete hydrostratigraphic horizons in the monitoring well boreholes, installation of permanent monitoring wells within the groundwater zones where impacts were determined to be greatest, and installation of piezometers within the same borehole to permit groundwater elevation monitoring of both the shallow and deep, regional aquifers.

The data collected for this RI and for earlier studies of the project area indicate that groundwater downgradient of the former Bunker Area and downgradient of other former RABSP parcels has been impacted by elevated concentrations of perchlorate and a variety of volatile organic compounds (VOCs) including TCE. While impacts have not been identified in samples obtained from CR-3, groundwater impacts extend approximately 8,500 feet southeast from the former Bunker Area and may be within the capture radius of CR-3. Downgradient of the former Bunker Area, impacts typically do not extend much more than 100 feet below the groundwater table. One notable exception was identified at well N-10 where impacts were measured approximately 155 feet below the groundwater table. Though perchlorate was detected at low levels in the two deepest samples obtained from the N-14 borehole (about 350 feet northwest of CR-3), these results are suspect and impacts at this location likely extend only to a depth of approximately 90 feet.

To evaluate potential remedial alternatives that might be employed to mitigate groundwater impacts, Remedial Action Objectives (RAOs) were first identified including:

- The selected alternative should prevent direct contact or ingestion by the public of groundwater containing contaminants that exceed regulatory-defined maxiumum contaminant levels (MCLs) or action levels (ALs).
- The preferred alternative should assure that replacement water is provided to the City of Rialto if MCLs or ALs are exceeded at well CR-3.
- The potential for further degradation of the aquifer downgradient of CR-3 should be minimized.
- The selected alternative should comply with state and federally mandated appropriate regulations and requirements (ARARs).

Eight potential remediation alternatives were initially considered. As summarized below, since four of these alternatives did not meet the plume containment RAO, they were not considered feasible and were eliminated from further analysis. The alternatives that were considered included:

- No Action – This alternative anticipates that groundwater impacts will not exceed MCLs and ALs at CR-3 and that, with such minimal threats to public health and environment, no remedial action is necessary. Existing and potential impacts near CR-3 exceed ALs and this alternative was eliminated from consideration.
- Direct Aquifer Treatment Upgradient of CR-3 – This alternative involves use of an in-situ (below ground) treatment technology to remove contaminants directly from groundwater before groundwater flows to well CR-3. (Retained for detailed consideration).
- Aquifer Treatment by Recirculating Wells Upgradient of CR-3 – This alternative involves use of an extraction well array to intercept the plume. Pumped water is then inoculated at the ground surface and reinjected to the aquifer where treatment occurs. (Retained for detailed consideration).
- Well-Head Treatment at CR-3 – This would involve treatment of groundwater pumped from CR-3 to remove contaminants before water is routed to the City's municipal supply system. Since analyses completed for this project indicated that pumping by CR-3 alone would not contain the plume and would "pull" contaminants to greater depths in the aquifer, this alternative was eliminated from consideration.
- Replace CR-3 Water with a New Well – This would involve drilling and construction of a new water supply well in an area of the groundwater basin that is not threatened by contaminants, and connection of the well to the City's municipal supply system. In addition to not intercepting the plume, this alternative requires that impacts in other areas of the basin be well understood. Accordingly, this approach was eliminated from consideration.
- Replace CR-3 Water with Another Source – This would involve an agreement with another water supply entity (e.g., San Bernardino Valley Municipal Water District) to procure and deliver water to the City's municipal water supply system. This approach would not intercept the plume and was eliminated from consideration.

- Groundwater Pumping, Above Ground Treatment and Aquifer Recharge – This would involve intercepting the plume of contaminants that are currently flowing toward well CR-3 with an array of groundwater extraction wells, pumping groundwater through a treatment plant to remove contaminants, and discharge of treated water to a groundwater recharge basin such as the Cactus Recharge Basin. (Retained for detailed consideration).
- Groundwater Pumping, Above Ground Treatment and Water Delivery to Rialto's Supply System – This would involve intercepting the plume with an array of extraction wells, pumping groundwater through a treatment plant, and delivery of treated water to Rialto's municipal supply system. (Retained for detailed consideration).

The four alternatives that were considered viable for the project (two in-situ treatment alternatives and two ex-situ alternatives) were evaluated in greater detail using criteria identified by the National Contingency Plan (NCP [40 CFR 300.430(e)(9)(iii)]) to address CERCLA requirements and considerations, as well as technical, policy, and end-use considerations. As such, these criteria served as the basis for selecting the preferred remedial action.

Based on the feasibility analyses, it is concluded that project objectives could best be met by intercepting the plume with a groundwater extraction network, ex-situ treatment, and delivery of treated water to the City's municipal supply system. However, given the project's tight implementation schedule and potential construction complications, the option of procuring water from another source should be retained as an interim alternative to assure that the City's water supply is not affected.

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1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a Draft Interim Remedial Investigation / Feasibility Study ("RI/FS") for mitigation of perchlorate and volatile organic compound (VOC) impacts to groundwater that have been identified near the City of Rialto's Well No.3 (CR-3) in Rialto, California (Figure 1). As such, this report is intended to support identification of an appropriate remedial response to the letter directive that the Regional Water Quality Control Board – Santa Ana Region (RWQCB) issued to the County of San Bernardino (County) on August 6, 2004, which requires that the County provide replacement water to the City of Rialto (City) should contaminants in samples from CR-3 exceed state or federal maximum contaminant (MCLs) or action levels (ALs).

1.2 GROUNDWATER IMPACTS NEAR CR-3

While perchlorate and VOCs have not been detected in samples from well CR-3, as detailed herein, field investigations indicate that these compounds are the primary threats to groundwater quality immediately upgradient of well CR-3. Perchlorate is an anion whose salts have been used in solid rocket propellant, munitions, explosives, fireworks, matches, air bags, leather tanning, steel fabrication, electroplating and a plethora of other applications. In fact, the primary sources of elevated perchlorate contamination of groundwater are considered to be related to its manufacture for military applications, testing and disposal of rocket motors, and periodic removal and replacement of solid fuels in missiles and rockets (Hatzinger et al., 2002). Owing to the limited shelf life of perchlorate fuels, the solid propellant was washed from missile/rocket casings using water under high pressure. Since trichloroethene (TCE) was also commonly used to clean casings during the fuel change-out operations, the resultant wastewater from these types of operations often contained high concentrations of both perchlorate and TCE. Perchlorate salts are highly soluble in water and dissociate completely. The resulting perchlorate anion is nonvolatile, highly mobile, and chemically stable in typical groundwater and surface water environments.

In 1997, the California Department of Health Services developed an improved testing method for perchlorate and this anion was subsequently identified at levels of concern in drinking water supplies throughout California and at least 13 other states. Current estimates suggest that the compound may affect the drinking water of as many as 15 million people nationwide (Hatzinger et al., 2002).

While the potential risks of low levels of perchlorate on humans are not fully understood, public health concerns currently focus on the potential effect of the anion on thyroid functions. Detailed toxicity assessments are continuing and the U.S. Environmental Protection Agency (USEPA) expects to establish MCLs for this compound by 2004. In the interim, the state of California has established a draft toxicity assessment that identifies a maximum drinking water concentration of 6 micrograms per liter (μg/L).

TCE is a suspected human carcinogen that can affect (and damage) several body organs and systems such as the central nervous system, respiratory system, liver, kidneys, and heart, and may cause contact dermatitis of the skin (Manahan, 2000). Both the USEPA and California Department of Health Services have established primary MCLs of 5 μg/L for TCE.

1.3 PROJECT OBJECTIVES

The objectives of this RI/FS include:

- Determine the nature and extent of groundwater impacts extending downgradient toward well CR-3 from source area(s) adjacent to the northeast corner of the County of San Bernardino's Mid-Valley Sanitary Landfill (MVSL).
- Identify existing and potential routes of migration through environmental media and exposure pathways.
- Determine the magnitude and probability of actual or potential harm to public health, safety, or welfare, or to the environment, posed by the contaminant plume.
- Collect the information necessary to evaluate remediation alternatives to mitigate the release.
- Provide sufficient information to select and support implementation of an appropriate remedial action to protect the regional groundwater resource and the City's municipal water supply infrastructure at well CR-3.

This RI/FS is not intended to address impacts to soils that have been identified on County property adjacent to the MVSL. Considering the depth to groundwater contaminants (greater than 350 feet), threats to public health and the environment near CR-3 are limited to groundwater migration pathways and are not associated with surface water, soil, or air migration pathways. Accordingly, this focused RI/FS only considers impacts to groundwater and the alternatives that might be undertaken to mitigate this condition.

In cooperation with the California Department of Toxic Substances Control (DTSC) and the RWQCB, a separate RI/FS document will be prepared by the County of San Bernardino to assure appropriate protection of the public health and environment associated with impacted soils on County property. That forthcoming RI/FS will examine additional exposure pathways from the source areas including surface water, soils, and air.

2.0 BACKGROUND

2.1 WELL CR-3

Well CR-3 was constructed in 1972 using 20-inch steel casing to a depth of approximately 860 feet. The well is reportedly screened at four depth intervals from 525 feet to 860 feet, and produces up to about 1850 gallons per minute (gpm), a significant portion of the City's municipal supply needs.

2.2 LOCATION

Well CR-3 is located in the north-central portion of the City of Rialto, immediately south of the City's municipal airport (Figure 1). This area is approximately 1.6 miles southeast of the former Rialto Ammunition Back-up Storage Point (RABSP) that was active during World War II and where a large portion of the munitions that were used in the Pacific theater of war were temporarily stored. As detailed in an earlier investigative report of the area (GeoLogic Associates [GLA], 2003), the RABSP area consisted of approximately 1000 acres in the area bounded by Casa Grande Drive (to the north), Locust Avenue (to the east), a projection of Bohnert Road (to the south), and a projection of Tamarind Avenue (to the west; Figure 1). The RABSP included several dozen bunkers, railroad lines, and barricades and generally housed munitions prior to their deployment in the Pacific theater.

After the war, the RABSP property was sold, resold, and sub-divided into numerous commercial enterprises. Throughout this period and continuing to the present, many of the original bunkers and roads continued to be used for commercial/industrial purposes, with pre-existing RABSP roadways and munitions bunkers subsequently used for the manufacture, storage, transport, and disposal of explosives, fireworks, and other potentially hazardous substances.

Adjacent to the northeast corner of the MVSL, a portion of the RABSP (hereafter the former "Bunker Area") is owned by the County of San Bernardino and is considered one of the potential sources of the perchlorate and VOC impacts that have been identified upgradient of well CR-3.

2.3 REGIONAL IMPACTS

2.3.1 <u>Impacts to Municipal Production Wells</u>

In 1997 and 1998, the Cities of Rialto and Colton, and the West San Bernardino County Water District (now West Valley Water District [WVWD]), collected groundwater samples from their municipal supply wells in the Rialto-Colton Groundwater Basin. Perchlorate was measured at concentrations below 18 μg/L (then the state action level) in five of the wells and at concentrations of 273 and 57 μg/L in the remaining two wells. The highest perchlorate concentrations (820 μg/L) were measured in samples from

WVWD Well No. 22, the well located closest to the former RABSP area (RWQCB, 2003).

2.3.2 Detection at MVSL Wells

Monitoring for perchlorate was also initiated at the County of San Bernardino's Mid-Valley Sanitary Landfill (MVSL) in October 1997. At that time, perchlorate was detected at only one well (F-6 at the southeastern corner of Unit II; Figure 2) and at a low concentration (4.2 μg/L, just above the laboratory's practical quantitation limit [PQL]). During the 11 quarterly monitoring events between October 1997 and July 2000, perchlorate was detected at well F-6 just two more times, and again, these detections were reported at trace-level concentrations (i.e., below the laboratory's PQL). In July 2000 the perchlorate concentration in the sample from well F-6 was measured at 10 μg/L, and by January 2001 it had risen to 250 μg/L. Since January 2001, perchlorate concentrations in samples from well F-6 have fluctuated between 56 and 300 μg/L (Figure 3).

2.4 RWQCB DIRECTED INVESTIGATIONS

Since the increase in perchlorate concentrations measured in samples from monitoring wells located near the southeastern corner of Unit II appeared to generally correspond with aggregate wash pond operations in the former Bunker Area, the County of San Bernardino initiated a field and laboratory investigation to better characterize groundwater conditions in the area. In discussions with RWQCB staff, a Work Plan for investigation was prepared (GLA, 2002a) and 8 monitoring well locations were identified. Six wells (F-6A, N-1, N-2, N-3, N-4, and N-5) were constructed southeast of the former Bunker Area along Stonehurst Avenue and 2 wells (S-1 and S-2) were constructed south and southwest of the MVSL (Figure 2). As detailed in the project report (GLA, 2002b), perchlorate was not detected in the southern wells (i.e., S-1 and S-2) but was found at elevated concentrations together with TCE and other VOCs (albeit at lower concentrations) in samples from wells southeast of the former Bunker Area.

Following review of these data, the RWQCB directed that the County of San Bernardino Solid Waste Management Division (SWMD) prepare and implement a Work Plan to investigate the former Bunker Area northeast of the landfill and determine the nature and extent of associated impacts to groundwater (RWQCB; September 26, 2002). Considering the historical use of the northeast corner of the County's property for RABSP bunker storage and for subsequent commercial rocket-fuel and fireworks use, the project Work Plan (GLA, 2002c) focused on an evaluation of soils in the former Bunker Area and determination of the downgradient extent of impacts. The Work Plan also recognized the bunker decommissioning work that had been completed with associated stockpiling of Bunker Area soils, and the use of a portion of the former Bunker Area as an aggregate processing water recharge pond.

Following RWQCB approval of the Work Plan (RWQCB; January 31, 2003), the SWMD initiated the second phase of investigation including the following:

- Literature and aerial photograph review to identify potential sources of perchlorate impacts near the former Bunker Area.
- Excavation of 17 shallow exploratory soils borings within stockpiled bunker debris and associated soils and excavation of 5 deep exploratory soil borings within the inactive aggregate wash ponds.
- Installation of 5 additional groundwater monitoring wells (N-6, N-7, N-8, N-9, and N-10) with associated temporary well sampling intervals in areas downgradient of the former Bunker Area to better characterize the nature and extent of groundwater impacts in the project area.
- Development of a three-dimensional numerical groundwater model of the project area to simulate groundwater flow and contaminant transport conditions near the site and to evaluate alternative responses to groundwater impacts in the area.

As detailed in the investigation report (GLA, 2003), analyses of soils excavated in the former Bunker Area failed to identify significant concentrations of perchlorate. However, the data collected during and after monitoring well construction indicated that significant perchlorate and VOC impacts to groundwater extended approximately 4000 feet downgradient (southeast) of the former Bunker Area. Of the VOCs that were detected, TCE was the most common and exhibited the highest concentrations; commonly exceeding its MCL. While tetrachloroethene (PCE) was also locally detected at concentrations that exceeded its MCL, PCE concentrations were typically lower than TCE concentrations by factors of 10 to 30.

2.5 SCOPE OF RECENT PHASE OF INVESTIGATION

In its letter of January 15, 2004, the RWQCB directed the County of San Bernardino to prepare a supplemental Work Plan to better characterize the distribution and source, or sources, of perchlorate and VOC impacts to groundwater associated with the former Bunker Area east of the MVSL. The Work Plan that was submitted to the RWQCB in February 2004 and approved on March 25, 2004 did not supersede, but rather supplemented, the original scope of work identified for the project (GLA, 2002c). As such, work tasks associated with the original Work Plan (such as preparation of a Bunker Area closure plan) are continuing.

As described herein, this third phase of investigation involved installation of 5 additional groundwater monitoring wells to better characterize impacted groundwater conditions downgradient of the former Bunker Area. Project work included:

- Installation of 25 temporary wells in boreholes concurrent with drilling operations associated with construction of 5 permanent groundwater monitoring wells.
- Chemical analysis of groundwater samples obtained from the wells.
- Completion of 3 variable rate (step) and 3 twenty-four hour aquifer pumping tests.
- Continued monthly monitoring of investigation monitoring wells constructed previously southeast of the former Bunker Area.

3.0 SITE SETTING

3.1 PHYSIOGRAPHIC SETTING

The major landforms in the project area consist of the bordering highlands and foothills of the San Bernardino Mountains, the northwest trending Lytle Creek and Cajon Creek Washes, and the southwest trending alluvial plains of the Upper Santa Ana Valley to the south (Figure 4). Major geographic features in the project area include Interstate Freeways 15 to the west and northwest, and Interstate 215 to the northeast. The Rialto Municipal Airport is located near the southern limits of the project area (Figure 1).

Geomorphically, the project area is located within the north-central portion of the broad east-west trending San Gabriel/San Bernardino Valley and approximately 2.3 miles south of the base of the San Gabriel Mountains. The natural topographic surface in the area is relatively flat with a 2 to 3 percent gradient to the south and southeast.

There are no well-established drainage courses in the immediate vicinity of the RABSP. Surface water flow generated during storm events occurs as sheet wash and minor channelized flow in a southerly direction along the natural topographic gradient.

3.2 CLIMATE

The San Bernardino valley enjoys a Mediterranean type climate with mild winters and hot summers. Rainfall averages about 15 inches per year, with most coming in the winter months. Potential evapotranspiration rates in the area amount to about 87.6 inches per year (California Irrigation Management Information System [CIMIS], 2003).

3.3 GEOLOGIC SETTING

The project area is located at the northern end of the Peninsular Ranges Geomorphic Province near its junction with the Transverse Ranges Geomorphic Province. This area of southwestern San Bernardino County is underlain by several fault-bound structural blocks, including the down-dropped San Bernardino Valley Block located between the San Andreas and San Jacinto faults; and the down-dropped Perris Block between the Elsinore fault to the west, the Cucamonga fault to the north and the San Jacinto fault to the east (Fife et al., 1976). As shown on Figure 5, the project area is positioned in the northeastern portion of the Perris Block.

The northern Rialto area is underlain by a considerable thickness of Quaternary alluvium overlying the Mesozoic basement complex. The maximum thickness of alluvium in the area is estimated to be greater than 900 feet near the Kaiser Steel Plant, approximately 6 miles southwest of the site (Fife et al., 1976). Unconsolidated Quaternary gravels, sands, silts, and clays associated with alluvial fan deposits (Qf) are exposed throughout the area and relatively recent channel deposits are present in all of the local unimproved drainages (Figure 6). Older alluvial deposits (Qao), including fanglomerate and older red-brown decomposed clay-rich alluvium, crop-out approximately 1.5 miles southeast of the site. Water well data in the vicinity suggests that some continental Tertiary deposits may be present between the Quaternary and older underlying Mesozoic units, though no local exposures of these materials have been identified. The basement complex underlying the alluvium and exposed in the San Gabriel Mountains north of the site consists of granitic and metamorphic rocks.

The region is tectonically active, and several active faults exist within 30 miles of the project area. These include the San Andreas, San Jacinto, Cucamonga, Glen Helen, and Whittier-Elsinore fault zones (Figures 5 and 6). The nearest active faults in the area are the San Jacinto Fault, located about 2.5 miles to the northeast; and the Cucamonga Fault located about 2.0 miles to the northwest. No known active or potentially active faults have been identified on the property.

3.4 HYDROGEOLOGY

3.4.1 Regional Conditions

The project area is located within the northwest portion of the Rialto-Colton groundwater basin (Dutcher and Garrett, 1963). Groundwater flow in the basin is controlled by several barriers and faults, some of which delineate the boundaries of the basin. The Rialto-Colton basin extends from Barrier J on the northwest to the Santa Ana River on the southeast (Figure 7). On the northeast it is bounded by the San Jacinto fault, which separates the basin from the Lytle and Bunker Hill basins. On the southwest it is separated from the Chino Basin by the Rialto-Colton Barrier and by Barrier H.

Dutcher and Garrett (1963) have presented evidence to indicate that inflow to the northwest portion of the basin is almost exclusively by leakage through Barrier J, with only a minor contribution from precipitation and infiltration. Recent work by the U.S. Geological Survey (Woolfenden and Kadhim, 1997; Woolfenden and Kozcot, 2000) indicates that significant underflow may also occur across the northern portions of the San Jacinto fault where it is coincident with Lytle Creek. South of this area, underflow across the San Jacinto fault (Barrier E) appears to be relatively limited. On the west side of the basin, the northern portions of the Rialto-Colton Barrier appears to similarly impede groundwater flow. Leakage from the Rialto-Colton Basin to the Chino Basin is apparently significant in the southeastern portion of the basin where the Rialto-Colton fault crosses the Santa Ana River but is not significant in the northern portions of the basin (Woolfenden and Kadhim, 1997; Woolfenden and Kozcot, 2000).

Dutcher and Garrett (1963) identified Barrier H as a sub-parallel feature of the Rialto-Colton fault. Based on data collected more recently (Figure 7; GLA, 1997a, 1997b), the U.S. Geological Survey now considers Barrier H to be a shorter and more northerly trending feature (Woolfenden and Kozcot, 2000).

Groundwater in the Rialto-Colton basin occurs within alluvial sediments at depths ranging from more than 400 feet below ground surface (bgs) northeast of the site to less than 100 feet bgs closer to the mountain front. Water well data suggests that groundwater in the northern and central portions of the basin flows to the south and southeast under an average gradient of about 0.02 to 0.04 ft./ft (Woolfenden and Kadhim, 1997; Woolfenden and Kozcot, 2000).

The U.S. Geological Survey studies of 1997 and 2000 identify three vertical hydrologic units. The upper unit is saturated only in areas adjacent to active water courses such as Lytle Creek and the Santa Ana River. In the project area, the middle unit is saturated and yields abundant water. At depths greater than about 500 feet, the lower unit yields smaller volumes of water.

Historical groundwater elevation measurements indicate that groundwater elevations within the Rialto-Colton basin have varied significantly in response to extended periods of drought and municipal/agricultural pumping. In the north-central portion of the basin, groundwater elevations dropped approximately 150 feet in the period from 1947 to 1977. From 1945 to 1995, the average annual pumping from the basin amounted to approximately 14,747 acre-feet (Woolfenden and Kadhim, 1997).

3.4.2 Local Conditions

The results described herein and those reported for the 1996-1998 Phase I and II VOC investigations are consistent and indicate the presence of three laterally-continuous aquifers within what Woolfenden and Kadhim (1997) first identified as the middle hydrologic unit within the Rialto-Colton Basin. These laterally continuous aquifers include an upper unconfined aquifer (hereafter the Upper Aquifer) that occurs at depths of about 245 to 340 feet below ground surface, an intermediate partially confined aquifer (hereafter, Intermediate Aquifer), and a deep regional confined aquifer (hereafter, Regional Aquifer) that provides much of the groundwater that is pumped in the area by municipal supply wells. The three aquifers are separated by low-permeability, laterally continuous aquitards that generally range in thickness from only a few feet to over 30 feet (Figure 8).

Groundwater in each of the aquifers occurs in sandy gravels, gravelly sands, and sands that typically have excellent water-bearing and water-yielding properties. Drilling and well installation data suggest that the three aquifers are laterally continuous with a downward hydraulic gradient between the individual units. While the Upper Aquifer had a saturated thickness of about 15 to 35 feet between 1996-1998 (GLA, 1997b, 1998), regional drought conditions have resulted in dewatering of much of the unit today. As a result, the uppermost groundwater unit that was consistently encountered in the current investigation was the Intermediate Aquifer.

In the project area, the Intermediate Aquifer is about 40 to 140 feet thick and its potentiometric surface typically extends above the top of the overlying aquitard. As discussed below, the Intermediate Aquifer actually consists of a number of smaller water-bearing units that are separated by relatively thin (e.g., < 5 feet thick) aquitards with a downward hydraulic gradient between the subunits. In the upper portion of the unit, the downward hydraulic gradient is typically less than a few feet while, at depth, the downward gradient was measured to be as much as 65 feet. A significantly thicker aquitard separates the Intermediate Aquifer from the Regional Aquifer and a substantial downward hydraulic gradient exists between these two units. This hydraulic gradient is almost 100 feet across the aquitard, and as much as 170 feet between the uppermost groundwater unit in the Intermediate Aquifer and the Regional Aquifer.

Though the full thickness of the Regional Aquifer was not penetrated by the project wells, data presented by Woolfenden and Kadhim (1997) indicate that in this area of the Rialto-Colton Basin the Regional Aquifer may extend 150 feet beyond the base of the aquitard (hereafter Regional Aquitard) that separates it from the Intermediate Aquifer. Below this depth, the "lower groundwater unit" and consolidated Tertiary marine sedimentary deposits are expected to yield significantly smaller volumes of groundwater.

Groundwater elevations are measured routinely in monitoring wells near the MVSL. These data indicate that groundwater elevations at the site have dropped as much as 58 feet within the past 4 years. Groundwater equipotential plans developed from MVSL monitoring data indicate that groundwater flow in the local Upper, Intermediate, and Regional Aquifers is consistent with the southeasterly basin-wide direction and gradients identified by the U.S. Geological Survey (Woolfenden and Kadhim, 1997).

The results of aquifer tests completed for the Phase I VOC EMP (GLA, May 1997a) and the results of tests completed recently (Section 6.7) indicate that the hydraulic conductivity of the Upper and Intermediate Aquifer materials in the project area are similar and range from about 10 to 60 feet/day. Literature review suggests that the porosity in both aquifers is approximately 20 to 35 percent (Driscoll, 1986). Based on these values and the average hydraulic gradient measured in the area (about 0.018 feet per feet), the groundwater velocity in the project area is estimated to be approximately 1 to 5 feet per day.

4.0 REMEDIATION INVESTIGATION

4.1 GENERAL

As described in Sections 2.3 and 2.4, field investigation of groundwater impacts downgradient of the former Bunker Area was completed in three phases. The first two phases of investigation were completed from August 2002 and August 2003 and involved installation of 13 permanent groundwater monitoring wells (GLA, 2003). The third, most recent, phase of field study occurred from April 26, 2004 to August 26, 2004 in accordance with a Work Plan (GLA, 2004) that was approved by the RWQCB (March 25, 2004). The third phase of work included the following elements:

- Drilling 5 exploratory borings to depths ranging from 445 to 640 feet below ground surface and construction of 5 groundwater monitoring wells (N-11 through N-15).
- Using temporary well sampling methods, collection of up to 7 water quality samples from discreet groundwater zones encountered during drilling of each boring.
- Laboratory analyses of groundwater samples obtained during drilling for VOCs (EPA Method 8260) and perchlorate (EPA Method 314.0).
- Construction of one 5-inch diameter groundwater monitoring well and 4 "combination" wells that were constructed with both 4-inch diameter wells and 2-inch diameter piezometers completed at differing depths.

- Geophysical logging of investigation wells.
- Monthly water quality monitoring for the presence of VOCs and perchlorate in the 5 new monitoring wells, 13 previously installed investigation monitoring wells, and one MVSL DMP monitoring well.
- Aquifer variable-discharge (step) and constant-discharge pumping tests completed down gradient of the MVSL in 3 of the newly installed monitoring wells.

Drilling and well construction operations for all three investigation phases were performed by California-licensed C-57 water well contractor working under the continuous observation of qualified geologists and under the supervision of California Certified Hydrogeologists. In order to evaluate the vertical distribution of groundwater impacts, monitoring well construction involved installation and sampling of "temporary wells" within discrete hydrostratigraphic intervals in each borehole.

The monitoring well drilling, groundwater sampling, and well installation methods used for project wells are detailed in Appendix A. At the RWQCB's request, 2-inch diameter piezometers were typically placed in boreholes together with 4-inch diameter permanent well casings. Owing to construction difficulties at well N-9 (see Section 4.8.3), well, N-12 was constructed as a replacement well using only 5-inch diameter well casing. Boring logs that depict the materials encountered in the monitoring well boreholes are provided in Appendix A together with well construction summary logs that identify the materials used and configuration of permanent monitoring wells and piezometers. A complete accounting of monitoring well drilling and installation methods is also provided in Appendix A.

In keeping with the earlier phases of investigation, the most recently installed monitoring wells were assigned a "N" designation to distinguish the borings and wells from landfill monitoring wells that have also been installed downgradient of the MVSL (Figure 2). Four of the new wells, N-11, N-13, N-14, and N-15, were installed approximately 3,400 to 10,000 feet downgradient of the former Bunker Area. Well N-12 was constructed near previously installed well N-9 which has been dry since it was constructed.

4.2 MONITORING WELL DRILLING

As detailed in Appendix A, project monitoring wells were drilled using air-rotary casing hammer (ARCH) drilling methods that were locally supplemented by mud-rotary drilling methods where heaving sands yielded difficult well construction conditions at the bottom of some boreholes. The ARCH technique was employed because it is relatively non-intrusive, maintains borehole stability, permits relatively precise identification of stratigraphic units and elevations, allows for identification of individual water-bearing units, and can facilitate discrete sampling of individual groundwater zones. The ARCH drilling method returns drill cuttings to the surface by a continuously circulating air current that is introduced to the base of the boring through the drill rod and drill bit. As the drill bit is advanced, borehole stability is maintained by pneumatically driving 11-3/4" and/or 9-5/8" diameter casing along with and following just behind the advancing drill bit.

Prior to beginning drilling operations, and between each borehole, all drill rig and sampling equipment were decontaminated using steam-cleaning equipment in combination with a stiff brush and a non-phosphate detergent solution. The temporary well sampling apparatus was also decontaminated between sampling intervals to minimize potential "cross-communication" between hydrostratigraphic units.

After reaching target depths, wells were typically installed either in the deep Regional Aquifer or in the temporary well sampling interval of the Intermediate Aquifer that yielded the highest concentration of perchlorate.

4.3 SOIL SAMPLING

In the first two phases of investigation, soil sampling included both "grab" samples of cuttings returns at regular 5-foot intervals and relatively undisturbed "ring" samples in select horizons. Owing to the coarse character of the alluvial soils in the area, ring sample collection was typically problematic, and laboratory analyses of the soil samples failed to detect contaminants. Soil sampling for the third phase of study involved continuous observation of drill cuttings and retention of grab samples at 5-foot vertical intervals during drilling.

4.4 INITIAL GROUNDWATER SAMPLING

Once drilling extended to about 20 feet above the anticipated depth to first groundwater, boreholes were allowed to equilibrate for a period of not less than 30 minutes to allow groundwater to enter the borehole. This equilibration protocol was observed on subsequent ten-foot vertical intervals, as needed, until first groundwater was identified. Once identified, the uppermost groundwater zone was sampled from the open borehole using the methods described in Appendix A.

4.5 TEMPORARY WELL SAMPLING

In order to evaluate the vertical extent of groundwater impacts at each well location, temporary monitoring wells were installed within discrete hydrostratigraphic zones as the borings advanced. As detailed in Appendix A, the temporary wells were constructed by advancing the borehole beyond the drill casing and then inserting a 2-inch diameter polyvinyl chloride (PVC) casing with a 5-foot long PVC well screen section. Commercial filter pack was placed around the screen and the interval above the screen was sealed to the level of the overlying aquitard using bentonite chips. Since the bentonite chips were typically placed at the same depth as the low-permeability soil interval that separated one hydrostratigraphic interval from another, the temporary well sampling intervals were effectively isolated from other borehole intervals. Once the temporary wells were installed, groundwater was allowed to equilibrate in the well for a minimum of 30 minutes before groundwater elevation measurements were obtained. The temporary wells were then purged and sampled in accordance with procedures detailed in Appendix A. The well casing was then pulled from the borehole and boring excavation continued.

Temporary sampling wells were generally installed at successive depths in each borehole until "clean" water (i.e., groundwater yielding no perchlorate concentrations) was identified. Due to the relatively extreme penetration of the boreholes below the water table and the unconsolidated nature of the alluvial materials encountered during drilling, "heaving" conditions were sometimes encountered that complicated selection of temporary well intervals. Borehole and temporary well information for all three phases of field investigation are summarized below.

Vertical Groundwater Sampling Summary

Well No.	Boring Depth (ft)	Temporary Well Samples	Total Groundwater Samples
F-6A	505	3	4
S-1	511	2	3
S-2	525	2	3
N-1	505	2	3
N-2	550	3	3
N-3	583	3	4
N-4	644	2	4
N-5	590	5	3
N-6	545	3	6
N-7	530	4	5
N-8	530	4	5
N-9	530	4	5
N-10	563	3	5
N-11	620	4	5
N-12	445	2	5
N-13	580	1	4
N-14	620	4	6
N-15	640	2	7

4.6 PERMANENT WELL & PIEZOMETER INSTALLATION

Based on the temporary well sampling results, permanent groundwater monitoring wells were installed in the hydrostratigraphic interval where the most significant impacts were identified. In areas where perchlorate impacts were not detected (e.g., wells N-2, N-4, and N-15), the permanent groundwater monitoring wells were installed near the bottom of the boreholes. Following well installation, piezometers were typically installed and screened across the upper-most groundwater units to permit long-term measurement of groundwater elevations in both the Intermediate and deeper aquifers at the same location.

As detailed in Appendix A, the monitoring wells that were constructed for the project were completed using 4-inch diameter schedule 80 PVC well casing and screen. One exception, well N-12, was completed with 5-inch diameter PVC casing and screen to permit aquifer pumping tests. The factory-slotted 0.02-inch wide well screens were between 10 and 35 feet long and were surrounded by a commercial (#3) sand filter pack. Filter packs were then sealed using a granular bentonite seal that typically extended across overlying aquitard deposits to isolate the well screens from the cement grout seal that was used to seal the remainder of the borehole annulus.

Piezometers were constructed using 2-inch diameter schedule 80 PVC well casing and screen. The factory-slotted well screens did not exceed 10 feet in length and were surrounded by commercial #3 filter pack sand. Filter pack sands were then sealed using a granular bentonite seal that extended a minimum of 10 feet above the sand. The remaining borehole annulus for the wells was sealed in accordance with Department of Water Resource standards (DWR, 1990) and were provided with either a traffic-rated flush-mounted vault box or an above-ground steel monument protected with traffic ballards. A summary of permanent well and piezometer construction depths is shown below.

Permanent Well and Piezometer Installation Intervals

Well	Permanent Well Screen Depth Interval	Piezometer Screen Depth Interval
F-6A	417-437	495-500
S-1	484-494	NA
S-2	486-496	305-355
N-1	395-425	496-501
N-2	415-445	497-502
N-3	442-462	545-555
N-4	445-515	601-621
N-5	372-402; 442-472	NA
N-6	412-422; 427-432	524-534
N-7	375-395; 405-410	520-530
N-8	446-461	517-527
N-9	460-470	520-530
N-10	405-435	546-556
N-11	460 - 495	403 - 413
N-12	427 - 437	NA

Well	Permanent Well Screen Depth Interval	Piezometer Screen Depth Interval
N-13	560- 570	368-388
N-14	560-580	408-438
N-15	625-640	375-405

4.7 AQUIFER PUMPING TESTS AND ANALYSES

4.7.1 Methods

Like earlier aquifer tests completed at well N-7 (GLA, 2003), the aquifer pumping tests for the third phase of study were completed using an electric submersible pump to discharge groundwater from monitoring wells N-11, N-12, and N-15. These wells were selected because of their representative spatial distribution throughout the contaminant plume downgradient of potential source areas near the former Bunker Area. Since project wells were constructed at large distances from one another, observation well analyses were not possible. All groundwater generated during aquifer testing was contained and legally disposed by the County's well contractor.

During the tests, calibrated pressure-transducers were placed within both the pumping well and (if installed) in the nested piezometer and connected to a computerized data-logger positioned at the ground surface. The groundwater elevation response to pumping within the wells was then measured and recorded.

4.7.2 Step Tests

Aquifer variable discharge (step) pumping tests included pumping each of the targeted wells at 3 incrementally increasing discharge rates for a duration of 60 minutes per pumping rate per test. The table below summarizes the step tests that were completed in RI monitoring wells.

Aquifer Step Test Summary

Well	Step	PumpingRate (gpm)	Duration (min.)	Drawdown (ft)	Avail. Drawdown at Start of Step
N-11	1	2.0	89	0.29	46
	2	3.0	90	0.36	45.7
	3	3.2	89	0.38	45.6
N-12	1	7.9	54	20.3	34
	2	9.3	59	24.4	13.7
	3	10.3	59	34	9.6
N-15	1	2.8	90	5.35	263
	2	4.0	88	8.39	257.7
	3	5.3	94	12.1	254.6

The minimal aquifer responses that were identified at wells N-11 and N-15 were related to the fact that these wells needed to be constructed to relatively great depths using 4-inch well casing, and the pumps that fit the wells could supply only limited volumes at the well construction depths. From the step test data it was determined that wells N-11 and N-15 would be pumped for 24 hours at the maximum discharge rate attainable and well N-12 would be pumped at 6 gallons per minute (gpm). These rates were selected to meet analytical requirements and to maximize potential drawdown.

4.7.3 <u>24-Hour Aquifer Pumping Tests</u>

Aquifer hydraulic properties were evaluated by pumping groundwater from monitoring wells N-11, N-12, and N-15 at relatively consistent rates of 5.45, 5.80, and 4.97 gpm, respectively, for 24 hours. At the end of pumping, total drawdown amounted to 0.84, 16.1, and 10.7 feet, respectively, in the three wells. As shown in Appendix E, the groundwater elevation response to pumping was measured and recorded within each pumping well using a pressure-transducer attached to a data logger. Following pumping, the wells were allowed to re-equilibrate for between 87 minutes (N-15) and about 6.5 hours (N-12), during which time the groundwater elevation responses to the changed condition were measured and recorded.

As detailed in Appendix B and summarized on Table 1, the pumping test data were evaluated using the computer program AquiferTestPro (Waterloo Hydrologic, 2002) and the Cooper-Jacob (1946), Theis (1935), Neuman (1975) and Theis recovery (Kruseman and Ridder, 1990) methods to calculate aquifer hydraulic conductivity (K). As shown on Table 1, the calculated K values range between 14.6 and 42.1 feet per day (ft/d).

4.8 WELL CONSTRUCTION DIFFICULTIES

Borehole and equipment difficulties were experienced locally during the three phases of investigation. In addition, vandalism rendered one well (S-1R) unfit for sampling following construction and one well (N-4) needed to be over-drilled to make it serviceable again.

4.8.1 <u>Wells S-1R and S-2</u>

Numerous difficulties during installation of monitoring wells S-1R and S-2. During initial excavation of well S-1, the drill bit was lost in the borehole at a depth of 480 feet, necessitating abandonment (sealing) of the borehole and excavation of a replacement borehole (S-1R) that extended to a depth of 505 feet. During retraction of the ARCH drive casing from the S-1R borehole, approximately 200 feet of the steel casing was lost in the borehole at an interval that prevented installation of a piezometer within the Intermediate Aquifer. Accordingly, S-1R was constructed using only 4-inch diameter well screen within the deepest portion of the borehole (i.e., screened from 484 to 494 feet). Subsequent to completion and initial sampling of well S-1R, vandals broke the steel well cover and filled the well with rocks. Well S-1R is no longer a functional well.

At well S-2 where hard drilling zones required a switch from ARCH to mud-rotary drilling methods at a depth of approximately 440 feet. After construction of the 4-inch diameter well screen from a depth of 486 to 496 feet and placement of hydrated bentonite chips, the contractor attempted to pump neat cement grout from the top of the screen to the base of the planned upper piezometer interval. Unfortunately, upon installation of the piezometer, it became clear that grout was actually placed within the piezometer's screened interval and the upper 2-inch piezometer was cemented in place. Accordingly, only the deep 4-inch diameter monitoring well is functional at this location.

4.8.2 Well N-4

Well N-4 was also vandalized when rocks were placed within the 4-inch diameter casing at this location. These rocks were later successfully removed by the drilling contractor to within 10 feet of the original depth of the well casing. Two-inch diameter well casing was subsequently placed within the original 4-inch diameter well casing. Thus, well N-4 is now equipped with a 2-inch piezometer within its lower (601 to 621 feet) depth interval and a 2-inch diameter piezometer within its upper (445 to 515 feet) depth interval. Both depth intervals are functional and may be sampled using a bailer.

4.8.3 Well N-9

As indicated on the boring and well construction summary logs presented in Appendix A, monitoring well N-9 was constructed within the fourth hydrostratigraphic interval sampled during drilling (between 460 and 472 feet below grade), in a well-graded gravelly sand unit. While sufficient groundwater was identified in this interval to permit temporary well sampling, following installation of the permanent monitoring well, groundwater levels quickly declined and the well is now currently dry.

In response to this anomalous condition, the well was investigated using video and geophysical logging techniques (Appendix C). Video inspection of the well indicated no damage to the well casing and screen, and no evidence of fouling by cement grout was identified. Review of the dual-induction gamma-ray log that was obtained for the well indicate that dry sands exist above approximately 386 feet and that sandy intervals below this depth are typically saturated. An exception is the well interval from 460 to 472 feet, which exhibits an unsaturated geophysical signature. While anomalous, this condition appears to be similar to unsaturated aquifer conditions identified for the upper portion of the Regional Aquifer in wells N-3, N-4, N-7, and N-8. The identification of perchlorate-impacted groundwater in the temporary well constructed in this interval may simply be the result of leakage around the seal above the temporary well and introduction of groundwater to this interval from saturated zones above it.

4.8.4 Well N-15

As indicated on the boring log (Appendix A), the exploratory borehole within which well N-15 was constructed was drilled to a total depth of 640 feet, approximately 260 feet below the water table. Also noted on the boring log for N-15 are the approximate depths where "heaving" conditions were encountered during ARCH drilling. Although the well contractor repeatedly attempted to mitigate the heaving conditions over a six day period, these attempts were unsuccessful. As a result, the bottom portion of well N-15 was constructed using mud-rotary drilling muds to overcome heaving sands. During final development of the nested piezometer installed adjacent to well N-15, it was noted that the measured depth of the piezometer casing was 382 feet, approximately 23 feet less than the 405-foot design depth that was measured during piezometer construction. Also, the measured pH of development water obtained from the N-15 piezometer was approximately 11.5. While the piezometer is functional (well screen remains open to the aquifer), it appears likely that neat cement has filled the bottom portion of the piezometer screen.

4.9 GEOPHYSICAL SURVEY RESULTS

Following final well development, geophysical surveys were completed in the five wells constructed for the third phase of study and at previously installed well N-10 (Appendix C). Geophysical surveys were completed by Pacific Surveys and included use of gamma-ray and dual-induction electrical conductivity methods to substantiate boring log lithologic and hydrostratigraphic observations.

4.10 LITHOLOGIC AND HYDROLOGIC RESULTS

4.10.1 Native Materials

The lithologic and hydrologic data obtained during the three phases of field study are generally consistent. As shown in the boring logs included in Appendix A, and in the geologic cross-sections shown on Plates I and II, coarse-grained sands, gravelly sands, and sandy gravels and gravels interbedded with finer grained silty sand, sandy silt, and clayey sand sequences were encountered in each borehole. While significant inter-fingering of individual units apparently occurs, the southerly dip of individual stratigraphic units appears to be generally parallel to the ground surface (Plates I, II and III).

In developing the geologic cross-sections shown on Plates I and II, three general types of soils were recognized: gravels and sandy gravels, sands and gravelly sands, and fine-grained soils. Since the most common soil type encountered in the borings were silty sands (Unified Soil Classification System [USCS] SM), and recognizing the variability that exists within this designation, an attempt was made to differentiate SM soils that potentially act as aquitards and those that might perform as aquifers. Accordingly, a distinction was made between generally coarse-grained, well-graded fine to coarse silty sands (assigned as "sandy" on the cross-sections), and the generally fine-grained silty fine sands that were assigned as "fine-grained" on the cross-sections.

4.10.2 Groundwater Occurrence

Groundwater depths in the project area were consistently greater to the north and decreased to the south. Groundwater was first encountered at depths ranging from 441 feet at well N-4 in the far northern portion of the study area to 315 feet at well S-2, southwest of the MVSL. For the 5 wells constructed in the third phase of field work, groundwater was first encountered at depths ranging from 400 feet at well N-12 north of the Rialto Municipal Airport, to 372 feet at well N-15 southeast of City of Rialto Well No. 3 (CR-3).

Groundwater elevation data obtained during this RI and in previous investigations in the area (GLA; 1997a, 1997b) indicate that a relatively minor downward hydraulic gradient typically exists between individual hydrostratigraphic units. While, the deep Regional Aquifer often exhibited a sharp reduction in static groundwater elevations compared to Intermediate Aquifer levels in the northern reaches of the study area, the groundwater elevation measurements that were obtained for the 5 well recently installed in the southern reaches of the project area indicates smaller differences across aquifer zones. Near the distal end of the plume, the greatest elevation differential was measured in the N-14 borehole where an approximately 37-foot change in groundwater elevation was measured between the 2 deepest groundwater units.

As was case for well N-9, perched groundwater conditions were also identified in the N-10, N-11 and N-13 borings where relatively thin (6 to 10 feet thick) groundwater zones were identified above moderately thick (27 to 77 feet thick) unsaturated sections. While the dry zone at well N-9 was found near the base of the Intermediate Aquifer, the perched zones in wells N-10, N-11, and N-13 were found near the top of the groundwater column.

4.10.3 Groundwater Flow Direction and Rates

The groundwater flow direction in the project area was evaluated using data from temporary wells, permanent Intermediate Aquifer wells, and Regional Aquifer piezometers. As shown on Figure 9, the groundwater equipotential contours developed using groundwater elevation measurements obtained for the uppermost groundwater zone encountered in project boreholes suggest a relatively consistent southeasterly flow path. The southeasterly groundwater flow direction and hydraulic gradient (0.016 feet per feet [ft/ft]) indicated for the uppermost groundwater surface is relatively consistent with observations made historically at the MVSL and agrees with the regional groundwater flow pattern identified by the USGS (Woolfenden and Kozcot, 2000).

The groundwater elevation contours that were developed for the deep Regional Aquifer (Figure 10) also indicate a southeasterly flow direction but a significantly flatter (0.001 to 0.003 ft/ft) hydraulic gradient. The change at depth to a flatter hydraulic gradient appears to reflect a significant hydraulic separation between the Intermediate and Regional aquifers.

Based on the measured hydraulic gradients (about 0.02), typical hydraulic conductivity values (10 to 60 ft/d) as determined for this and earlier studies of the area (e.g., GLA; 1996, 1997, 2002), and assuming an average porosity of 0.25, the groundwater velocity in the project area is estimated to range from about 1 to 5 feet per day, with an average of about 3 feet per day. Considering the flatter gradient in the deep Regional Aquifer, groundwater velocity in this unit may be only about 1 foot per day.

4.11 GROUNDWATER ANALYSES

4.11.1 Laboratory Testing

Groundwater samples that were obtained from the monitoring wells and boreholes were sealed, placed in ice-cooled containers, and delivered to the laboratory for analyses of perchlorate (USEPA Method 314.0) and VOCs (Method 8260) using standard chain-of-custody procedures (Appendix D). While analyses of soil and groundwater samples that were collected from wells near the former Bunker Area also included tests for explosives (Method 8330) and N-nitrosodimethylamine (NDMA) by Method 8270, these compounds were not detected. Following construction, project monitoring wells were sampled monthly and tested for perchlorate and VOCs.

4.11.2 Analytical Results

The results of the laboratory analyses of groundwater samples obtained from boreholes, temporary wells, and permanent monitoring wells are presented in Appendix D and are summarized on Tables 2 through 19. As indicated on Figure 11, perchlorate was measured above laboratory quantitation limits in groundwater samples from 11 of the 17 permanent monitoring wells that were constructed for the project, and at a trace concentration in one of the wells (N-7). Perchlorate was not detected in samples from the 2 monitoring wells that were constructed north (N-4) and immediately northeast (N-2) of the former Bunker Area, nor was it detected in samples from the 2 wells that were constructed south (S-1R) and southwest (S-2) of the MVSL. No perchlorate was detected in samples from well N-15, the most downgradient well installed for the project.

Of the 5 wells recently constructed near the southern reaches of the plume, the highest perchlorate concentrations were detected in samples from replacement well N-12 (between 160 and 200 μg/L), just south of well N-9.

Within individual boreholes, perchlorate was typically measured at greater concentrations in samples collected from the upper groundwater zones. Near CR-3, though low levels of perchlorate were measured in the deepest 2 samples obtained from N-14, perchlorate was either not detected in samples collected from below about 500 feet bgs, or was detected at trace-level concentrations (between laboratory MDL and PQL values). Recognizing the fact that perchlorate was not detected in the middle zone in N-14 (i.e., above the two deep "detections"), the results for the two deepest zones (which are identical) are considered suspect and may be related to drilling rather than aquifer conditions.

Aside from municipal water constituents and common laboratory and field contaminants, samples from N-12 contained 10 VOCs, more than any other project borehole. Of these 10 VOCs, 5 were measured above the laboratory's PQL, and only TCE was detected above established state and federal MCLs (Table 16). Discounting laboratory and treatment-related VOCs, samples from borings N-14 and N-15 did not indicate impacts from VOCs.

4.12 NATURE AND EXTENT OF GROUNDWATER IMPACTS

This section provides a summary of the data obtained recently for the third phase of project study and integrates data obtained in earlier studies of the area (GLA; 2002b, 2003).

4.12.1 Nature of Impacts

Data collected for this project indicates that groundwater downgradient of the former Bunker Area has been impacted by elevated concentrations of perchlorate and a variety of VOCs. As shown on Tables 2 through 19, near source areas such as the former Bunker Area, perchlorate concentrations were measured as high as 1000 μg/L (N-3), 530 μg/L (N-5), and 310 μg/L (N-8). In this source-proximate area, TCE was determined to be the most common VOC and it typically exhibits the highest VOC concentrations, commonly exceeding its MCL. Other VOCs that were detected above their laboratory quantitation limits (i.e., above trace levels) include 1,1-dichloroethane, 1,1-dichloroethene, 1,2-dichloropropane, cis-1,2-dichloroethene, trichlorofluoromethane, dichlorofluoromethane, PCE, and 1,1,1-trichloroethane. While measured PCE concentrations occasionally exceeded its MCL, PCE concentrations are typically significantly below TCE by factors of 10 to 30 (Tables 2 through 19). Close to the former Bunker Area at well N-5, the TCE:PCE multiple is closer to 40:1.

4.12.2 Extent of Impacts

As shown on Tables 2 through 19, groundwater contaminant impacts are typically greatest in shallow groundwater zones and generally do not extend much beyond a depth of approximately 100 feet below the groundwater table. One notable exception is well N-10 where the thickness of groundwater impacts extends approximately 156 feet. While impacts at well N-13 were measured to a depth of approximately 171 feet below the groundwater table, only trace-level concentrations were identified in samples greater than 8 feet below the groundwater table. As discussed above, the detection of perchlorate above laboratory PQL levels in the two deepest groundwater samples from well N-14 appears to be anomalous and may not be representative of real aquifer conditions. This inference is supported by the non-detect result for the sampling horizon above the two deep "detections", and the absence of perchlorate in samples obtained from CR-3, whose uppermost well screen intercepts the same aquifer units sampled at the base of N-14.

To evaluate the extent of perchlorate and TCE impacts within the plume, the laboratory results for individual temporary well samples were related to thickness of the individual hydrostratigraphic intervals from which they were obtained to develop a "mass load" of perchlorate within groundwater at each project monitoring well location. As shown in Appendix E, these calculations involve determination of the volume of water within discrete groundwater zones, calculation of the mass of perchlorate within each vertical zone based on measured perchlorate concentrations, and then summation of the total mass of perchlorate at each well location.

Using these mass load data, perchlorate impacts downgradient of the former Bunker Area appear to extend a distance of about 8,500 feet from the former Bunker Area, and potentially within the capture radius of CR-3 (Figure 11). Since groundwater modeling completed for an earlier investigation of the project area (GLA, 2003) indicates that a 1999 release to groundwater would extend only about 4,000 feet downgradient of the former Bunker Area, it is concluded that groundwater impacts may be associated with multiple release events and sources.

Like the perchlorate data, the laboratory results obtained for TCE were associated with discrete hydrostratigraphic intervals to calculate the mass loads of TCE at individual well locations. These data were then contoured to develop the TCE mass load plan shown on Figure 12. As indicated, the distribution of TCE impacts in groundwater is similar to perchlorate but does not extend as far to the southeast.

Finally, with regard to the lateral extent of the release, the data obtained during construction of wells N-7 and N-13 define the approximate western border of the plume and indicate trace- to low-level perchlorate and VOC impacts. Similarly, the eastern border of the plume is indicated by wells N-6 and N-11 where samples yield only low-level concentrations of perchlorate and VOCs. While N-1 might also indicate the eastern edge of the plume, its eastward-deflected geometry and the absence of VOCs identified elsewhere in the release suggest that groundwater impacts at this location may be associated with a second perchlorate plume that is currently being characterized northeast of the former Bunker Area. This interpretation is supported by the results of the groundwater modeling that was completed for the earlier investigation of the project area (GLA, 2003), which indicated that the eastern limit of the release exists west of wells N-1 and N-6.

4.13 CONCEPTUAL SITE MODEL

The data collected for this RI/FS indicate that perchlorate and VOC impacts to groundwater near CR-3 originate in source areas located near the former Bunker Area, northeast and east of the MVSL. Perchlorate concentrations ranged from as high as 1000 µg/L near the interpreted source areas to approximately 26 µg/L near the southern, distal end of the plume, significantly above the state's AL of 6 µg/L. TCE ranged from as high as 730 µg/L immediately adjacent to the sources of the release to non-detectable concentrations near the southern end of the plume. The state and federal MCL for TCE is 5 µg/L.

Use of a portion of the former Bunker Area as an aggregate wash pond may have resulted in conveyance of perchlorate and TCE to groundwater from impacted near-surface soils. Similarly, commercial/industrial activity on nearby parcels may also have resulted in groundwater impacts. In any event, once contaminants reached groundwater, plume migration occurred to the southeast in agreement with the groundwater gradient in the area. Since a downward hydraulic gradient exists between water-bearing units in the area, contaminants also migrated downward with impacts typically extending to a depth of approximately 500 feet, or about 100 feet below the groundwater table.

The lateral limits of the plume are well defined on its west side by the analytical results obtained for samples obtained from wells F-3, N-7, and N-13. The eastern side of the plume is defined by the results that were obtained for samples from wells N-2, N-1, N-6 and N-11. The distal margin of the plume is approximately 8500 feet southeast of the former Bunker Area, as defined by the results that were obtained for samples from wells N-14 and N-15.

5.0 FEASIBILITY STUDY

5.1 REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) were developed to identify specific goals to mitigate groundwater impacts near well CR-3 and to protect human health and the environment. As noted above, these conditions are generally limited to elevated concentrations of perchlorate and VOCs in groundwater downgradient of the former Bunker Area and upgradient of well CR-3. The level of allowable exposure considered in definition of the Remedial Action Objectives is defined by either the federal or state MCLs and ALs.

The RAOs developed to address groundwater impacts near CR-3 are:

- Prevent direct contact or ingestion of groundwater containing perchlorate or VOCs that exceed MCLs or ALs.
- Provide replacement water if MCLs or ALs are exceeded at well CR-3.
- Minimize further degradation of the aquifer downgradient of CR-3.
- Comply with Applicable or Relevant and Appropriate Requirements (ARARs).

5.2 POTENTIAL REMEDIAL ALTERNATIVES

A number of alternatives have been identified that might satisfy the RAOs established for the project. These include:

<u>No Action</u> – This alternative anticipates that groundwater impacts will not exceed MCLs and ALs at CR-3 and that, with such minimal threats to public health and environment, no remedial action is necessary.

<u>Direct Aquifer Treatment Upgradient of CR-3</u> – This alternative involves use of an in-situ (below ground) treatment technology to remove contaminants directly from groundwater before groundwater flows to well CR-3. This process employs a large number of treatment wells and relies on a time-released inoculant substrate to produce an oxygen-deficient (anaerobic) environment that promotes microbial degradation of contaminants.

<u>Aquifer Treatment by Recirculating Wells Upgradient of CR-3</u> – While this alternative involves groundwater pumping at a series of plume interception wells, contaminant

removal occurs within the aquifer after an "inoculant" is introduced at water reinjection wells.

Well-Head Treatment at CR-3 – This would involve construction of a treatment plant to treat groundwater pumped from CR-3. Following contaminant removal, water would be routed to the City's municipal supply system.

Replace CR-3 Water at a New Well – This alternative would involve drilling and construction of a new water supply well in an area of the groundwater basin that is not threatened by contaminants. Pumped water would be routed to the City's municipal supply system.

Replace CR-3 Water with Another Source – This would involve an agreement with another water supply entity (e.g., San Bernardino Valley Municipal Water District) to procure and deliver water to the City's municipal water supply system.

Groundwater Pumping, Above Ground Treatment and Aquifer Recharge – This would involve intercepting the contaminant plume upgradient of well CR-3 using an array of groundwater extraction wells. Pumped groundwater would then be treated at a treatment plant and water would then be discharged to a groundwater recharge basin (e.g., Cactus Recharge Basin).

Groundwater Pumping, Above Ground Treatment and Water Delivery to Rialto's Supply System – This alternative would also involve intercepting the plume with an array of extraction wells. However, following treatment, water would be delivered to Rialto's municipal supply system.

5.3 PRELIMINARY SCREENING OF POSSIBLE RESPONSE ACTIONS

An initial screening of the possible response actions described above and their associated remedial technologies and process options was completed to reduce the number of alternatives requiring detailed evaluation. In completing this screening review, the mitigation alternatives identified above were considered in light of their anticipated effectiveness to meet the project's RAOs.

No Action - Since it is possible that contaminant plume constituents exceeding MCLs and ALs may flow to and past CR-3, the "no action" alternative may not be effective in protecting human health and the environment. As a result, the no action alternative is not considered applicable to address groundwater conditions near CR-3 at this time.

Direct Aquifer Treatment Upgradient of CR-3 - By intercepting and treating the contaminant plume, this alternative would satisfy all the RAOs and is, thus, considered a viable remedial response to impacted groundwater conditions near CR-3.

Aquifer Treatment by Recirculating Wells Upgradient of CR-3 – Since this alternative would also result in interception of the plume and protection of the groundwater resource at CR-3, it also satisfies the RAOs and is considered a viable remedial response to impacted groundwater conditions near CR-3.

Well-Head Treatment at CR-3 - Groundwater modeling completed for this Feasibility Study (Appendix E) indicates that groundwater pumping at well CR-3 would not contain the plume of contaminated groundwater currently flowing toward the well. Since this well is screened considerably below the water table (i.e., from 525 to 860 feet below the ground surface), in the absence of upgradient systems, high volume pumping at this well poses the risk that contaminants would be pulled deeper into the aquifer. While this approach would satisfy the RAO of providing replacement water for any impacts that may be identified at CR-3, it fails the RAO of minimizing further degradation of the aquifer downgradient of CR-3. Accordingly, this alternative is not considered applicable to address groundwater conditions near CR-3 at this time.

Replace CR-3 Water at a New Well - Since impacts in the Rialto-Colton basin appear to be associated with multiple sources that have not yet been fully defined, there appears to be insufficient data at this time to permit selection of a location for construction of a new well. Since this alternative also fails to meet the RAO of minimizing further degradation of the aquifer downgradient of CR-3, it is not considered applicable to address groundwater conditions near CR-3 at this time.

Replace CR-3 Water with Another Source - While it may be possible to obtain water that meets the project's water quality objectives from another source outside the Rialto-Colton basin, this alternative also fails to meet the RAO of minimizing further degradation of the aquifer downgradient of CR-3. As such, it is not considered applicable to address groundwater conditions near CR-3 at this time.

Groundwater Pumping, Above Ground Treatment and Aquifer Recharge - By intercepting and treating the contaminant plume, this alternative would satisfy all the RAOs and is considered a viable remedial response to impacted groundwater conditions near CR-3.

Plume Interception, Ex-Situ Treatment and Delivery of Water to Rialto's Supply System - By intercepting and treating the contaminant plume, this alternative would satisfy all the RAOs and is considered a viable remedial response to impacted groundwater conditions near CR-3.

Summary of Preliminary Screening

On the basis of the screening level analysis presented above, it is concluded that the following response actions are applicable to impacted groundwater conditions near CR-3:

- Alternative No. 1 – Direct Aquifer Treatment Upgradient of CR-3.
- Alternative No. 2 – Aquifer Treatment by Recirculating Wells Upgradient of CR-3.
- Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge by Treated Water.

- Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, and Delivery of Treated Water to Rialto's Supply System.

5.4 ARARs

Remedial actions must attain a degree of cleanup that assures protection of human health and the environment. Additionally, remedial actions that leave any hazardous substance, pollutant, or contaminant must meet a cleanup level or standard of control that at least attains federal and/or more stringent state standards, requirements, criteria, or limitations that are "applicable or relevant and appropriate" under the circumstances of the release.

In sum, "applicable" requirements are those standards, criteria, or limitations promulgated under federal or state environmental law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Where a promulgated standard, criteria, or limitation is not directly applicable, it may be "relevant and appropriate" if, in the exercise of the Agencies' discretion, it addresses problems or situations sufficiently similar to those encountered and are deemed to be well-suited to the particular site.

ARARs may be (a) "chemical-specific," which are generally health- or risk-based numerical values or methodologies that set limits upon concentrations of specific contaminants in the environment; (b) "location-specific," which are generally restrictions upon certain types of activities because of existing site characteristics (e.g. wetland, floodplain, historic site); or (c) "action-specific", which are technology or activity based restrictions triggered by the type of remedial action under consideration. In addition to ARARs, the USEPA or the State may, as appropriate, identify other advisories, criteria, or guidance, whether or not promulgated, to be considered for a particular site.

Table 20 provides a listing of ARARs that appear to be applicable to the four viable remediation alternatives that were identified in Section 5.3. The table includes identification and citation of the requirements, a description of the specific elements of the requirement and comments regarding the applicability of the requirements to individual remediation alternatives.

6.0 SUMMARY AND EVALUATION OF REMEDIATION ALTERNATIVES

As described above, four remediation alternatives were retained for detailed analyses. These remediation alternatives are summarized on Tables 21 through 24 and are described below.

6.1 VIABLE REMEDIAL ALTERNATIVES

Each of the viable remedial alternatives that are considered in this section anticipate that plume migration will continue towards well CR-3 for 10 years or longer, depending on variable contaminant sorption and aquifer properties.

6.1.1 No. 1 – Direct Aquifer Treatment Upgradient of CR-3

Groundwater could be treated directly using an extensive series of wells to deliver an "innoculant" to promote microbial growth and biodegradation of perchlorate and VOCs. Both perchlorate and the VOCs of concern at the site (e.g., TCE and PCE) require an oxygen reducing (anaerobic) environment and a nutrient source in order for the appropriate microbial population to develop and consume (reduce) these contaminants. During microbial fermentation of the introduced substrate (e.g., acetate or lactate), hydrogen would be released as an electron donor for degradation of the perchlorate ion to chlorate, chlorite and, finally, chloride. Similarly, TCE would be reduced to its daughter products cis-1,2-dichloroethene, vinyl chloride, and, finally, to ethene.

This approach has been taken at several locations by "loading" the wells with canisters of substrate that dissolve slowly through time in groundwater. Since the area affected by the "inoculant" is typically relatively small, this approach generally involves use of multiple rows, or a tight network, of wells to assure that the inoculant is broadcast evenly through the aquifer and to promote microbial development throughout the zone of impacts. Downgradient of the inoculant wells, the substrate is consumed and dispersed, thus limiting the aquifer treatment zone. In shallow groundwater environments, well construction costs are relatively low and this type of in-situ treatment may be cost-competitive with aboveground treatment systems. However, discussions with vendors indicate that 50 to 100 wells could be required to adequately inoculate impacts near CR-3. Well construction costs alone for this could amount to $7 million, and annual inoculant costs would likely be on the order of $842,000 (Table 21).

6.1.2 No. 2 – Aquifer Treatment by Recirculating Wells Upgradient of CR-3

Plume containment could also theoretically be achieved using a series of plume extraction wells to intercept the plume and to deliver groundwater to a second series of water re-injection wells that would be positioned upgradient of the extraction wells. Like the two Ex-Situ treatment options, groundwater extraction rates would need to vary, depending on groundwater elevations, to assure plume containment downgradient of the aquifer treatment zone.

Before groundwater re-injection, the water would be routed through a dosing tank to be inoculated with an appropriate substrate that promotes microbial growth and contaminant consumption within the aquifer. Like the groundwater extraction system described above, a re-circulating well treatment system would likely involve installation of 25 to 50 injection wells. These wells would be positioned upgradient of approximately 6 large groundwater extraction wells, and aquifer treatment would occur in the zone between the 2 well arrays.

While the groundwater extraction wells could effect plume capture in a fairly broad spacing between wells (e.g., 400-foot centers [Appendix E]), the aquifer reinjection wells would need to be positioned significantly closer to one another (e.g., 100-foot centers) to assure that the inoculated water is effectively dispersed throughout the aquifer treatment zone. As shown on Table 22, initial capital costs for the recirculating in-situ treatment system are also expected to be quite high (~$7.4 million). Continuous inoculant "dosing" of pumped water for reinjection and associated O&M is expected to amount to approximately $1,149,000 per year.

6.1.3 No. 3 – Groundwater Pumping, Above Ground Treatment and Aquifer Recharge

This approach involves use of an array of groundwater extraction wells that would be positioned across the width of the plume to intercept and contain contaminant migration toward well CR-3. Groundwater modeling completed for this project indicates that 6 wells positioned on 400-foot centers across the plume and pumping 175 to 350 gallons per minute (gpm) would be sufficient to contain the plume. Lower pumping rates could be used to maintain plume containment during periods of drought (such as the current condition) when groundwater elevations are relatively low. If groundwater levels were to increase 100 feet in the project area, a larger pumping rate of 350 gpm would be required for plume containment.

In order to remove VOCs and perchlorate from pumped water, it is possible that a two-stage treatment process may be required. While granular activated carbon (GAC) systems have been used in some cases to remove both perchlorate and VOCs, this approach is considered location specific (experimental) and, for project purposes, it is anticipated that VOC treatment and perchlorate treatment will require separate treatment processes. Although treatment plant vendor bids need not specify a specific process (i.e., vendors need only meet the cleanup requirements), for project purposes it is assumed that ex-situ treatment would be performed in conventional fashion using a GAC system to remove VOCs and an ion-exchange system to remove perchlorate. In addition, to minimize the complexity of the treatment system, it is assumed that ion-exchange would be performed using disposable resins. This would eliminate the need for and costs associated with trucking or pumping perchlorate salt brines (a potential treatment byproduct) from the site.

Once treated, water could be pumped in a new pipeline that would extend along Baseline Avenue east to the Cactus Spreading Basin near the northwestern corner of Baseline Avenue and Cactus Street (Figure 13). Water discharged to the basin would then recharge the aquifer.

As shown on Table 23, initial capital costs for this alternative are expected to be about $3.5 million. At the anticipated maximum pumping rate, annual O&M costs to pump and treat groundwater near CR-3 is expected to amount to approximately $1.1 million.

6.1.4 No. 4 – Groundwater Pumping, Above Ground Treatment, Delivery to Rialto's Supply System

This mitigation alternative is the same as the ex-situ treatment approach described above except that treated water would be routed to the City of Rialto's municipal supply system rather than to an aquifer recharge basin. While some minor costs would be realized to connect the treatment plant to the municipal supply line at CR-3, overall costs would be significantly reduced by eliminating approximately 1 mile of pipeline that would otherwise be required to convey treated water to the spreading basin.

As shown on Table 24, initial capital costs for this alternative are expected to be about $3.2 million. At the anticipated maximum pumping rate, annual O&M costs to pump and treat groundwater near CR-3 is expected to amount to approximately $1.1 million.

6.2 EVALUATION CRITERIA

The purpose of the detailed analysis of remediation alternatives is to assess the expected performance of each alternative with respect to the nine evaluation criteria set forth in the National Contingency Plan (NCP [40 CFR 300.430(e)(9)(iii)]) As described below, these criteria were developed to address all CERCLA requirements and considerations, as well as technical, policy, and end-use considerations. As such, they serve as the basis for selecting the ultimate remedial action.

In estimating the overall performance advantage of each of the alternatives considered, the nine evaluation criteria were weighted in accordance with their estimated importance for the project. Each of the remediation alternatives was then rated with regard to expected performance in these various categories.

The nine federal criteria are divided into the following three categories:

- Threshold factors;
- Primary balancing factors; and
- Modifying factors.

In addition to the federal criteria, six California state criteria were identified as set forth by DTSC (1995; Appendix VIII of Official Policy EO-95-007-PP).

Federal criteria are reviewed first, followed by the state criteria.

6.2.1 Threshold Factors

The threshold factors include overall protection of human health and the environment and compliance with ARARs. The threshold factors are the initial criteria that each alternative is evaluated against. Any alternative failing to satisfy these criteria is eliminated from further evaluation. Each of the threshold factors is discussed below.

Overall Protection of Human Health and the Environment

This criterion assesses whether a given alternative provides adequate protection of human health, the environment, and the beneficial uses of ground water. It evaluates how risks posed by contaminated groundwater could be eliminated, reduced, or controlled through treatment, engineering, or institutional controls. It also evaluates the degree to which the alternative satisfies the Remedial Action Objectives (RAOs). An alternative that is not sufficiently protective of human health and the environment may be eliminated by this criterion.

Compliance with Applicable or Relevant and Appropriate Requirements

This criterion considers the ability of an alternative to address RAOs and chemical-, action-, and location-specific ARARs during construction, completion, and post-completion phases of the alternative. Constraints that RAOs and ARARs may impose on implementation of an action are also considered. Compliance with RAOs and ARARs is a critical issue in the selection of remediation alternatives.

The ARARs for the Site are discussed in detail in Section 5.4 of this report, and the importance of this criteria is ranked very high (VH).

6.2.2 **Primary Balancing Factors**

The primary balancing factors are the primary criteria upon which the analysis of alternatives is based. If an alternative satisfies the threshold factors, it is further evaluated against these criteria. Each of the primary balancing factors is discussed below.

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion measures the long-term reliability of the alternative, including any uncertainties that may be associated with the alternative. It also assesses the permanence of the proposed alternative. This criterion includes an evaluation of the magnitude of residual risk posed by the presence of untreated waste or treatment of residuals and an assessment of the reliability of the proposed equipment and process. Finally, it evaluates the adequacy of institutional actions or containment measures and assesses the potential need to replace technical components of the alternative.

Given the threat to public health, the ability of the alternatives to maintain their performance characteristics over an extended period of time with limited maintenance is considered a very important (very high [VH]) ranking criteria.

Reduction of Toxicity, Mobility, or Volume through Treatment

This criterion measures the degree to which the alternative will achieve a permanent reduction in toxicity, mobility, or volume (TMV) through treatment. This criterion also assesses how treatment is used to address the principal threats posed by contaminated water near CR-3. It evaluates the degree to which the treatment is irreversible and the residual compounds that may remain following treatment. This criterion is used to address the CERCLA/Superfund Amendments and Reauthorization Act preference for alternatives that use treatment to destroy or minimize movement of contaminants.

Since wastes or residuals may remain mobile in groundwater, for evaluation purposes, this criteria was ranked very high (VH).

Short-Term Effectiveness

This criterion is used to assess potential short-term risks to human health (construction workers and surrounding populace) and the environment during implementation of the alternative. The criterion considers the time period required to complete the action along with measures that can be employed to minimize impacts of the action.

Although limited, the health risk that could be associated with worker exposure is considered a very high ranking criteria (VH).

Implementability

This criterion measures the ease or difficulty of conducting the proposed remediation. Included in this criterion are the technical feasibility of the project, the reliability of the technology, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remediation. This criterion considers the availability of space at the site to complete the action, the availability of equipment and materials, the ability to perform additional action(s), and special labor skills required to perform the action. It also considers the administrative reasonability of implementing the proposed alternative, including the time required to obtain proper permits and approvals. This criterion favors proven technologies that are widely available and simple to implement or construct and operate.

Implementability is considered a critical (VVH) criterion for all pathways because technically or administratively complex solutions are not appropriate in light of the need to effect remediation in a timely manner.

Cost

Costs that are grossly excessive compared to the overall effectiveness of alternatives may be considered as one of several factors used to eliminate alternatives.

This criterion assesses the financial burden associated with implementing the alternative. It evaluates the capital costs, both direct and indirect, and operation, maintenance and monitoring (OM&M) costs. Direct capital costs include construction costs or expenditures for labor, materials, equipment, and subcontractors associated with the remedial action. Due to the uncertainty associated with remedial actions, a 20 percent contingency is applied to the sum of direct and indirect capital costs. Indirect capital costs include costs associated with engineering, permitting, construction management, and other services necessary to carry out the remedial action. OM&M costs include operational labor and maintenance materials associated with the extended operation, maintenance, and reporting for each alternative. Costs are given as present worth costs, and assumptions are provided on the period of performance for each alternative.

Since these capital costs may not be immediately recoverable from other responsible parties, this criterion is considered a very high ranking (VH) criterion for all remediation alternatives.

6.2.3 Modifying Factors

The modifying factors include state and community acceptance. These factors are discussed below.

State Acceptance

This assessment reflects the state's (or regulatory agency's) apparent preferences among or concerns about alternatives. State acceptance will be ascertained from discussions with DHS and RWQCB staff regarding remediation alternatives. Because agency approval will be required before any mitigation is implemented, the past approval history or future potential for approval of a given alternative is considered to be a high (H) ranking criterion.

Community Acceptance

This assessment reflects the community's apparent preferences among, or concerns about, alternatives. The community's response will be ascertained based on assumed response from the community. Given the threat to the community's water supply, this criterion is considered to be a high (H) ranking criterion.

6.2.4 California State Criteria

The six California State criteria are summarized below. These State criteria correlate to the nine Federal criteria.

Health and Safety Risks

This criterion evaluates the current and future health and safety risks associated with no remediation and with implementing the alternative remedial measures. This criterion is fully considered under the federal evaluation criterion of "Overall Protection of Human Health and the Environment."

Beneficial Uses of Site Resources

This criterion evaluates present and potential future beneficial uses of project resources. This criterion is fully considered under the federal criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs."

Effect of Remedial Actions on Ground Water Resources

This criterion evaluates the effect of the proposed remedial action on regional ground water resources. The federal criteria of "Overall Protection of Human Health and the Environment" and "Compliance with ARARs" fully incorporate this state criterion.

Site-Specific Characteristics

This state criterion requires remedy selection to consider site-specific characteristics. Remedy selection considered all-site specific characteristics, such as site geology, hydrogeology, chemicals, and previous remedial actions near the site. This state criterion is fully considered in the federal criterion of "Long-Term Effectiveness," "Short-Term Effectiveness," and "Implementability."

Cost-Effectiveness of Alternative Remedial Action Measures

This criterion evaluates the relative cost-effectiveness of various remediation alternatives in light of their expected success in meeting RAOs. This state criterion is fully considered in the federal criteria entitled, "Long-Term Effectiveness and Permanence" and "Cost."

Potential Environmental Impacts of Remedial Action

This criterion evaluates the potential environmental impacts of the alternative remedial actions. The federal criteria of "Short-Term Effectiveness" and "Long-Term Effectiveness and Permanence" consider environmental impacts during and after the remedial action.

6.3 EVALUATION OF REMEDIATION ALTERNATIVES

Preliminary screening of alternatives described in Section 5.3 of this report clearly indicates that some form of plume interception and treatment will be required to effectively mitigate groundwater impacts near well CR-3. The following section provides a detailed analysis of the four viable remediation alternatives that were retained following the preliminary screening assessment.

For the purpose of selecting a preferred mitigation alternative, each of the four viable remediation alternatives is subject to detailed evaluation with respect to the nine federal criteria presented above. As previously stated, the six state of California criteria are considered a subset of the nine federal criteria. Table 25 presents the total weighted performance anticipated for each alternative. The purpose of the alternative comparison is to consider similarities and differences between alternatives.

6.3.1 Overall Protection of Human Health and the Environment

Owing to the heterogeneity of aquifer materials in the area, the four remediation alternatives are expected to vary significantly with respect to their expected ability to protect human health and the environment (ranking fair to very good).

Alternative No. 1 – Direct Aquifer Treatment

The variable aquifer properties of the "inter-braided" coarse sands, gravels and finer grained silty units are expected to result in "tortuous" groundwater flow that would make it difficult to assure an even distribution of inoculants via passive well canisters. Accordingly, though such a system would likely include a large number of potentially redundant wells (with associated extra costs), its efficiency and effectiveness would remain suspect. Another factor that could limit the protection that might be provided by this approach is the need to remove/destroy two types of contaminants (i.e., VOCs and perchlorate). For instance, while one substrate may be favorable for VOC removal, it may not support microbial degradation of perchlorate. Thus, significant bench-scale testing would need to be completed to identify an optimum inoculant mix.

<u>Alternative No. 2 – Aquifer Treatment by Recirculating Wells</u>

While the re-circulating in-situ approach also includes an array of groundwater extraction wells to contain the plume, even if the inoculant is successful in contaminant removal/destruction, this approach could also result in a loss of residual inoculant downgradient of pumping wells with some associated degradation of the aquifer.

<u>Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge</u>

Other than minor losses of water to evaporation, this approach would be protective of human health and the environment.

<u>Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System</u>

This alternative would be protective of human health and the environment, and would minimize evaporative "waste" of water.

6.3.2 Compliance With ARARs

<u>Alternative No. 1 – Direct Aquifer Treatment</u>

Inasmuch as this remedial alternative relies on direct treatment of groundwater within the aquifer, the listing of applicable ARARs for this approach is relatively short compared to ex-situ methods. In addition, since its O&M requirements would be infrequent, ARAR compliance for this option is expected to be the least difficult of the 4 alternatives.

<u>Alternative No. 2 – Aquifer Treatment by Recirculating Wells</u>

While the re-circulating in-situ approach also includes involves below-ground treatment, this alternative also requires an array of groundwater extraction wells to contain the plume. While ARAR compliance for this alternative is expected to involve fewer requirements than ex-situ treatment approaches, it will be somewhat more complicated than for the Direct In-Situ alternative.

<u>Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge</u>

Like Alternative No. 4, this alternative would result in generation of hazardous wastes in the form of spent carbon in the GAC vessels and spent resin on ion-exchange columns. In addition, this alternative would also necessitate compliance with surface water discharge requirements and could involve wildlife and habitat issues.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

This alternative would be similar to Alternative No. 3 but would not involve surface water discharge and would likely not involve habitat or wildlife issues.

6.3.3 **Long-Term Effectiveness**

Alternative No. 1 – Direct Aquifer Treatment

The effectiveness of the passively delivered inoculant to be distributed evenly in the aquifer treatment zone would be difficult to monitor and concerns would remain regarding the system's long-term effectiveness.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

Though a water circulation system could promote a better inoculant distribution than the direct approach described above (i.e., Alternative No. 1), since this approach could also result in a loss of residual inoculant downgradient of pumping wells, with some associated degradation of the aquifer, its long-term effectiveness is not considered as high as the ex-situ approaches.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Pump and treat systems have demonstrated long-term reliability.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

Pump and treat systems have demonstrated long-term reliability.

6.3.4 **Reduction of Toxicity, Mobility, or Volume**

Alternative No. 1 – Direct Aquifer Treatment

While the volume of contaminants could be reduced in this approach, if the inoculant dispersal is not effected evenly, the toxicity and mobility of contaminants would not be affected.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

Though the toxicity of contaminants would not be affected, the use of groundwater extraction wells would greatly limit their mobility and treatment would eventually reduce their volume.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Though the toxicity of contaminants would not be affected, the use of groundwater extraction wells would greatly limit their mobility and treatment would reduce their volume.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

Like Alternatives 2 and 3, use of groundwater extraction wells for this alternative would greatly limit contaminant mobility and volume but would not affect toxicity.

6.3.5 **Short-Term Effectiveness**

Alternative No. 1 – Direct Aquifer Treatment

Since this approach involves the gradual change in redox conditions and microbial growth within the aquifer, it would not be effective in the short-term. Worker exposure to contaminants and treatment compounds would be minimal.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

Though the contaminant destruction would not occur for some time, use of groundwater extraction wells would quickly contain the plume. Worker exposure to contaminants and treatment compounds would be minimal.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Plume containment and contaminant removal/destruction would occur fairly quickly. Worker exposure to contaminants would be minimal.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

Plume containment and contaminant removal/destruction would occur fairly quickly. Worker exposure to contaminants would be minimal.

6.3.6 **Implementability**

Alternative No. 1 – Direct Aquifer Treatment

Considering the large number of wells that would be required to assure adequate distribution of substrate inoculant, the technical challenges associated with implementation of this alternative would be considerable. These concerns would include assuring that wells are properly located, spaced, and vertically positioned within boreholes, and the need for appropriate dosing of substrate to promote anaerobic conditions and microbial growth for destruction of both perchlorate and VOCs.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

Implementation of this alternative would involve surmounting the technical challenges associated with both inoculant wells (described above) and extraction wells. Since circulation of water within the aquifer treatment zone would gradually change the character of groundwater pumped for inoculant dosing, the dosing rates and constituents would also have to be periodically modified to assure optimal redox conditions and microbial growth.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Pump and treat systems are routinely installed throughout the United States and the ease in construction of the two treatment methods envisioned here (GAC and ion-exchange) is well documented. Use of the Cactus Spreading Basin would require that the area is secured from trespass by children and pets etc.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

Pump and treat systems are routinely installed throughout the United States and the ease in construction of the two treatment methods envisioned here (GAC and ion-exchange) is well documented.

6.3.7 Costs

Detailed cost information for each alternative is provided on Tables 21 through 24.

Alternative No. 1 – Direct Aquifer Treatment

Owing to the need for a large number of inoculant wells, capital costs for construction of this alternative treatment system are expected to be approximately $7 million. Annual O&MM costs are expected to be about $840,000.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

The capital costs for this alternative ($7.4 million) would include both inoculant and extraction wells. Though dosing might be optimized in regular evaluations of the aquifer mixing zone groundwater chemistry, the inoculant operation would involve considerable engineering oversight and materials. Annual O&MM costs are expected to be about $1.15 million.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Owing to the need to extend a pipeline from the Cactus Spreading Basin to the plume interception well array near CR-3, capital costs for this alternative ($3.5 million) are somewhat higher than those anticipated for Alternative No. 4. While treatment system operations would be fairly routine, with energy costs for groundwater pumping, annual O&MM costs are expected to be about $1.4 million.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

Capital costs for this alternative ($3.2 million) would also need to take into account connection to the City's supply system. Treatment system operations would be fairly simple but would need to address DHS requirements for connection to a municipal supply system. With energy costs to pump extraction wells, annual O&MM costs are expected to be about $1.4 million.

6.3.8 State and Community Acceptance

Alternative No. 1 – Direct Aquifer Treatment

State agencies and community members consider perchlorate and VOC contamination of the Rialto-Colton groundwater basin to represent an immediate threat to the City of Rialto's water supply system. As such, treatment systems like Alternative No. 1 that take time to become effective and which employ seldomly implemented technologies would likely not be warmly accepted.

Alternative No. 2 – Aquifer Treatment by Recirculating Wells

While this approach would contain contaminant migration faster than Alternative No. 1, its costs would be relatively high and its long-term operation would be relatively complicated and costly. Accordingly, agency oversight would also likely need to be fairly high. Considering the complexity of the system, state and community acceptance would not be expected to be as high as for conventional pump and treat systems.

Alternative No. 3 – Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

This approach employs commonly used technologies to intercept, contain, and treat groundwater impacts. While delivery of treated water would minimize the consumptive use of groundwater in the basin, it would be achieved at an evaporative loss and ignores the costs that would be expended to pump groundwater for treatment. As such, its state and community acceptance is expected to be mixed.

Alternative No. 4 – Groundwater Pumping, Above Ground Treatment, Water Delivery to Rialto's Supply System

This approach also employs commonly used technologies to intercept, contain, and treat groundwater impacts. Since this approach would maximize community resources by delivering a potable product for use by the City, its state and community acceptance is expected to be high.

6.4 RECOMMENDED REMEDIATION ALTERNATIVE

Based on the analysis of remediation alternatives identified above, it is concluded that project's RAOs could best be met by Alternative No. 4 with groundwater pumping, above ground treatment, and delivery of treated water to the City's municipal supply system. However, given the tight project timeframe imposed by the RWQCB, an alternative water supply source should be procured on an interim basis until the preferred remedial response (Alternative No. 4) is implemented. This would assure that the City's water supply needs are met even if MCLs or ALs are exceeded at CR-3 before the new treatment plant is constructed.

6.5 POST-CONSTRUCTION MONITORING AND CONTINGENCY PLANS

As part of the plume mitigation activities, long-term post-construction monitoring and contingency plans will be developed and implemented to assure that this system provides adequate protection to human health and the environment. While these plans will be submitted formally during the design stage of remediation, it is anticipated that the system may include regular groundwater monitoring and reporting to the RWQCB and DHS.

7.0 CLOSURE

This report is based on the data described herein. Our firm should be notified if conditions are found that differ from those described in this report, since this may require a re-evaluation of the conclusions presented herein. This report has not been prepared for use by parties and projects other than those named or described herein. It may not contain sufficient information for other parties or other purposes.

This report has been prepared in accordance with generally accepted engineering and hydrogeologic practices, and makes no other warranties, either expressed or implied, as to the professional advice or data included in it.

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President

8.0 REFERENCES

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TABLES

Table 1
Aquifer Pumping Test Summary
Estimated Hydraulic Conductivity Calculations
Investigation of Perchlorate Impacts to Groundwater
Rialto, California

Well	Drawdown/Recovery	Confined / Unconfined	Analysis Method[2]	Analysis Interval	Hydraulic Conductivity[3]	Average[4]
N-7[1]	Drawdown	Confined	C-J	middle	22.0	
				late	7.61[5]	
			Theis	n/a	16.8	19.22
		Unconfined	C-J	middle	30.0	
				late	10.6[5]	
			Neuman	n/a	20.6	
			Theis	n/a	6.23[5]	24.86
	Recovery	Confined	Theis Recov.	middle	23.60	
		Unconfined	Theis Recov.	middle	24.80	24.19
	Average for All Tests					**22.61**
N-11	Drawdown	Unconfined	C-J	late	36.7	
			Neuman	mid-late	10.5	
			Theis	late	23.9	20.96
	Recovery	Unconfined	Theis Recov.	late	229[5]	n/a
	Average for All Tests					**20.96**
N-12	Drawdown	Confined	C-J	middle	14.6	
				late	4.30[5]	
			Theis	late	23.9	18.68
	Recovery	Confined	Theis Recov.	n/a	42.10	n/a
	Average for All Tests					**28.04**
N-15	Drawdown	Confined	C-J	early	16.6	
				middle	3.28[5]	
				late	15.4	
			Theis	late	2.09[5]	15.99
	Recovery	Confined	Theis Recov.	n/a	0.78[5]	n/a
	Average for All Tests					**15.99**

Notes: 1 - Well N-7 was considered as both a confined and unconfined well.
2 - Cooper-Jacob (C-J [1946]), Neuman (1976), Theis (1935), Theis Recovery (Kruseman-deRidder [1990]).
3 - Units are feet per day.
4 - Average as geometric mean.
5 - Not included in calculated average.

TABLE 2
SUMMARY OF S-1 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS S1-1 8/9/2002 298.0	S1-2 8/10/2002 333	S1-3 8/13/2002 389
GENERAL INORGANICS				
Perchlorate	µg/L	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):				
*** Acetone	µg/L	51	9.2	***4.2**
cis-1,2-Dichloroethene	µg/L	**0.49**	0.60	ND
1,1-Dichloroethane	µg/L	ND	**0.27**	ND
Dichlorodifluoromethane	µg/L	**0.60**	2.4	ND
Tetrachloroethene	µg/L	7.1	12	**0.25**
*** Toluene	µg/L	ND	2.3	1.7
Trichloroethene	µg/L	**0.38**	0.61	ND
Trichlorofluoromethane	µg/L	ND	**0.59**	ND

ANALYTE	WELL ID DATE DEPTH (ft)	MONITORING WELL S1-4" 8/29/2002 484 - 494
GENERAL INORGANICS		
Perchlorate	µg/L	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):		
** Bromodichloromethane	µg/L	1.6
** Bromoform	µg/L	**0.32**
** Chloroform	µg/L	1.3
** Dibromochloromethane	µg/L	1.5
Toluene	µg/L	1.6

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 3
SUMMARY OF S-2 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS S2-1 8/29/2002 315	S2-2 8/30/2002 382	S2-3 9/3/2002 436	S2-4 9/10/2002 495
GENERAL INORGANICS					
Perchlorate	µg/L	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Acetone	µg/L	ND	ND	9.2	ND
Dichlorodifluoromethane	µg/L	1.1	**0.63**	ND	ND
** Dibromochloromethane	µg/L	ND	ND	ND	**0.28**
Tetrachloroethene	µg/L	0.78	0.76	ND	ND
*** Toluene	µg/L	ND	ND	4.2	ND

ANALYTE	WELL ID DATE DEPTH (ft)	MONITORING WELL S-2 10/3/2002 486 - 496
GENERAL INORGANICS		
Perchlorate	µg/L	ND
DETECTED VOLITILE ORGANIC COMPOUNDS (EPA 8260):		
** Bromodichloromethane	µg/L	0.52
** Bromoform	µg/L	1.4
** Chloroform	µg/L	2.5
** Dibromochloromethane	µg/L	2.4

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 4
SUMMARY OF F-6A ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS 6A-1 8/4/2002 395.5	 6A-2 8/4/2002 412	 6A-3 8/5/2002 453	 6A-4 8/5/2002 502
GENERAL INORGANICS					
Perchlorate	µg/L	470	820	11	100
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Acetone	µg/L	18	13	19	19
** Chloroform	µg/L	0.86	**0.36**	ND	ND
1,1-Dichloroethane	µg/L	1.7	0.52	ND	ND
1,2-Dichloropropane	µg/L	10	2.6	ND	ND
*** Methylene Chloride	µg/L	5.1	**0.89**	ND	ND
Tetrachloroethene	µg/L	7.0	1.8	ND	ND
Trichloroethene	µg/L	23	20	2.1	0.93

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 4 (CONT'D)
SUMMARY OF F-6A ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Oct 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003	Mar 2003
GENERAL CHEMISTRY							
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	NA	NA	130
Bicarbonate	mg/L	NA	NA	NA	NA	NA	160
Chemical Oxygen Demand	mg/L	NA	NA	NA	NA	NA	8.8
Chloride	mg/L	NA	NA	NA	NA	NA	3.9
Dissolved Oxygen	mg/L	NA	NA	NA	NA	NA	NA
Nitrate as N	mg/L	NA	NA	NA	NA	NA	5.47
Perchlorate	µg/L	270	250	220	250	110	150
Sulfate	mg/L	NA	NA	NA	NA	NA	14
Total Dissolved Solids	mg/L	NA	NA	NA	NA	NA	238
METALS							
Calcium	mg/L	NA	NA	NA	NA	NA	45
Magnesium	mg/L	NA	NA	NA	NA	NA	7.1
Sodium	mg/L	NA	NA	NA	NA	NA	520
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Chloroform	µg/L	0.65	**0.27**	**0.22**	ND	**0.16**	**0.18**
Dichlorodifluoromethane	µg/L	**0.73**	ND	ND	ND	0.91	**0.22**
1,1-Dichloroethane	µg/L	**0.27**	**0.21**	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	0.74	1.2	0.9	1.5	0.69	**0.31**
*** Methylene Chloride	µg/L	ND	**0.33**	**0.27**	ND	**0.36**	ND
Tetrachloroethene	µg/L	2.3	2.5	1.9	2.8	1.5	1.2
Trichloroethene	µg/L	51	48	38	41	15	20
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
*** bis(2-Ethylhexyl)phthalate	µg/L	NA	NA	NA	NA	NA	0.84
*** Hexachloroethane	µg/L	NA	NA	NA	NA	NA	***0.71**
N-Nitrosodimethylamine (NDMA)	µg/L	0.02	NA	NA	NA	NA	0.29

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 4 (CONT'D)
SUMMARY OF F-6A ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Apr 2003	May 2003	Jun 2003	Jul 2003	Aug 2003	Sep 2003	Oct 2003
GENERAL CHEMISTRY								
Alkalinity as CaCO3 (Total)	mg/L	150	140	NA	NA	NA	NA	NA
Bicarbonate	mg/L	180	170	NA	NA	NA	NA	NA
Chemical Oxygen Demand	mg/L	25	60	NA	NA	NA	NA	NA
Chloride	mg/L	3.7	4.8	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L	9.4	8.4	NA	NA	NA	NA	NA
Nitrate as N	mg/L	4.9	5.32	NA	NA	NA	NA	NA
Perchlorate	µg/L	140	150	170	150	140	130	160
Sulfate	mg/L	14	15	NA	NA	NA	NA	NA
Total Dissolved Solids	mg/L	212	228	NA	NA	NA	NA	NA
METALS								
Calcium	mg/L	51	52	NA	NA	NA	NA	NA
Magnesium	mg/L	7.4	7.9	NA	NA	NA	NA	NA
Sodium	mg/L	13	16	NA	NA	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Chloroform	µg/L	**0.21**	**0.23**	**0.26**	**0.32**	**0.21**	**0.19**	**0.35**
Dichlorodifluoromethane	µg/L	ND	**0.29**	ND	ND	**0.21**	**0.15**	**0.20**
1,1-Dichloroethane	µg/L	**0.12**	**0.15**	**0.15**	ND	**0.13**	**0.14**	**0.17**
1,2-Dichloropropane	µg/L	**0.29**	**0.29**	**0.35**	**0.40**	**0.25**	**0.48**	**0.39**
*** Methylene Chloride	µg/L	**0.16**	**0.30**	**0.28**	**0.28**	**0.28**	**0.33**	**0.32**
Tetrachloroethene	µg/L	1.4	1.2	1.6	2.0	1.2	1.1	1.7
Trichloroethene	µg/L	25	25	30	39	21	19	37
Trichlorofluoromethane	µg/L	**0.11**	**0.080**	**0.13**	ND	**0.080**	ND	**0.10**
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):								
*** bis(2-Ethylhexyl)phthalate	µg/L	**0.95**	**0.92**	NA	NA	NA	NA	NA
*** Hexachloroethane	µg/L	0.32	0.31	NA	NA	NA	NA	NA
N-Nitrosodimethylamine (NDMA)	µg/L	0.25	0.24	NA	NA	NA	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 4 (CONT'D)
SUMMARY OF F-6A ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	May 2004	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY									
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	140	140	10	130	150
Bicarbonate	mg/L	NA	NA	NA	170	170	10	160	180
Chemical Oxygen Demand	mg/L	NA	NA	NA	25	31	26	8.8	60
Chloride	mg/L	NA	NA	NA	4	4	1	3.7	4.8
Dissolved Oxygen	mg/L	NA	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	NA	NA	NA	5	5	0	4.9	5.47
Perchlorate	µg/L	240	210	230	165	186	52	110	270
Sulfate	mg/L	NA	NA	NA	14	14	1	14	15
Total Dissolved Solids	mg/L	NA	NA	NA	228	226	13	212	238
METALS									
Calcium	mg/L	NA	NA	NA	51	49	4	45	52
Magnesium	mg/L	NA	NA	NA	7	7	0	7.1	7.9
Sodium	mg/L	NA	NA	NA	16	183	292	13	520
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
*** Chloroform	µg/L	**0.41**	**0.42**	0.55	0.26	0.31	0.14	0.16	0.65
Dichlorodifluoromethane	µg/L	**0.14**	**0.16**	**0.22**	0.22	0.32	0.27	0.14	0.91
1,1-Dichloroethane	µg/L	**0.43**	0.55	0.52	0.17	0.26	0.16	0.12	0.55
1,2-Dichloropropane	µg/L	3.00	3.60	3.2	0.59	1.10	1.14	0.25	3.6
*** Methylene Chloride	µg/L	0.36	**0.41**	0.43	0.31	0.31	0.06	0.16	0.41
Tetrachloroethene	µg/L	3.1	2.2	4.3	1.80	2.00	0.86	1.1	4.3
Trichloroethene	µg/L	26	17	40	28.00	30.75	11.35	15	51
Trichlorofluoromethane	µg/L	ND	**0.01**	0.20	0.09	0.09	0.04	0.01	0.13
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):									
*** bis(2-Ethylhexyl)phthalate	µg/L	NA	NA	NA	NC	NC	NC	NC	NC
*** Hexachloroethane	µg/L	NA	NA	NA	NC	NC	NC	NC	NC
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 4A
SUMMARY OF F-6 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	May 2004	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY									
Perchlorate	µg/L	64	59	62	62	62	3	59	64
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
*** Chloroform	µg/L	0.60	0.64	0.68	1	1	0	0.6	0.68
1,1-Dichloroethane	µg/L	**0.33**	**0.33**	**0.32**	0	0	0	0.32	0.33
1,1-Dichloroethene	µg/L	ND	0.054	0.054	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	1.30	1.5	1.3	1	1	0	1.3	1.5
Dichlorodifluoromethane	µg/L	**0.21**	**0.24**	**0.21**	0	0	0	0.21	0.24
*** Dibromochloromethane	µg/L	ND	0.12	0.12	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	ND	0.17	0.17	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	ND	3.2	2.7	NC	NC	NC	NC	NC
*** Toluene	µg/L	3.70	0.063	0.063	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	ND	0.061	0.061	NC	NC	NC	NC	NC
Trichloroethene	µg/L	65	60	59	60	61	3	59	65
Trichlorofluoromethane	µg/L	**0.11**	**0.12**	0.060	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 5
SUMMARY OF N-1 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS			SOIL	
ANALYTE	WELL ID DATE DEPTH (ft)	N1-1 8/9/2002 415	N1-2 8/9/2002 447	N1-3 8/12/2002 502	N1-1D 8/8/2002 395	N1-2D 8/8/2002 420
GENERAL INORGANICS						
Perchlorate	μg/L	39	8.8	9.0	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Acetone	μg/L	53	**3.5**	48	NA	NA
*** Methylene Chloride	μg/L	ND	ND	**1.1**	NA	NA
*** Toluene	μg/L	ND	2.6	0.77	NA	NA
Trichloroethene	μg/L	ND	ND	0.90	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 5 (CONT'D)
SUMMARY OF N-1 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Sep 2002	Nov 2002	Dec 2002	Jan 2003	Feb 2003
GENERAL CHEMISTRY						
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	NA	NA
Bicarbonate	mg/L	NA	NA	NA	NA	NA
Chemical Oxygen Demand	mg/L	NA	NA	NA	NA	NA
Chloride	mg/L	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L	NA	NA	NA	NA	NA
Nitrate as N	mg/L	NA	NA	NA	NA	NA
Perchlorate	µg/L	35	35	31	26	25
Sulfate	mg/L	NA	NA	NA	NA	NA
Total Dissolved Solids	mg/L	NA	NA	NA	NA	NA
METALS						
Calcium	mg/L	NA	NA	NA	NA	NA
Magnesium	mg/L	NA	NA	NA	NA	NA
Sodium	mg/L	NA	NA	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260): ND						
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):						
*** bis(2-Ethylhexyl)phthalate	µg/L	NA	NA	NA	NA	NA
N-Nitrosodimethylamine (NDMA)	µg/L	0.010	NA	NA	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 5 (CONT'D)
SUMMARY OF N-1 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Mar 2003	Apr 2003	May 2003	Jun 2003	Jul 2003	Aug 2003
GENERAL CHEMISTRY							
Alkalinity as CaCO3 (Total)	mg/L	160	160	160	NA	NA	NA
Bicarbonate	mg/L	190	190	200	NA	NA	NA
Chemical Oxygen Demand	mg/L	10	47	70	NA	NA	NA
Chloride	mg/L	4.5	4.1	7.5	NA	NA	NA
Dissolved Oxygen	mg/L	NA	9.3	8.6	NA	NA	NA
Nitrate as N	mg/L	3.48	3.9	3.77	NA	NA	NA
Perchlorate	µg/L	26	23	20	21	19	18
Sulfate	mg/L	9.5	9.8	24	NA	NA	NA
Total Dissolved Solids	mg/L	244	224	228	NA	NA	NA
METALS							
Calcium	mg/L	53	56	55	NA	NA	NA
Magnesium	mg/L	7.4	7.2	6.9	NA	NA	NA
Sodium	mg/L	32	12	12	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260): ND							
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
*** bis(2-Ethylhexyl)phthalate	µg/L	**2.0**	0.72	0.74	NA	NA	NA
N-Nitrosodimethylamine (NDMA)	µg/L	0.27	0.25	0.25	NA	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 5 (CONT'D)
SUMMARY OF N-1 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Sep 2003	Oct 2003	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	160	160	0	160	160
Bicarbonate	mg/L	NA	NA	190	193	6	190	200
Chemical Oxygen Demand	mg/L	NA	NA	47	42	30	10	70
Chloride	mg/L	NA	NA	5	5	2	4.1	7.5
Dissolved Oxygen	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	NA	NA	4	4	0	3.48	3.9
Perchlorate	μg/L	14	16	23	24	7	14	35
Sulfate	mg/L	NA	NA	10	14	8	9.5	24
Total Dissolved Solids	mg/L	NA	NA	228	232	11	224	244
METALS								
Calcium	mg/L	NA	NA	55	55	2	53	56
Magnesium	mg/L	NA	NA	7	7	0	6.9	7.4
Sodium	mg/L	NA	NA	12	19	12	12	32
VOLATILE ORGANIC COMPOUNDS (EPA 8260): ND								
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):								
*** bis(2-Ethylhexyl)phthalate	μg/L	NA	NA	NC	NC	NC	NC	NC
N-Nitrosodimethylamine (NDMA)	μg/L	NA	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 6
SUMMARY OF N-2 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID / DATE / DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS				SOIL
	WELL ID	N2-1	N2-2	N2-3	N2-4	N2-1D
	DATE	8/13/2002	8/14/2002	8/13/2002	8/15/2002	8/13/2002
	DEPTH (ft)	428	454	474	493	430
GENERAL INORGANICS						
Perchlorate	µg/L	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Acetone	µg/L	*28	*8.6	*9.8	***4.9**	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 6 (CONT'D)
SUMMARY OF N-2 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Sep 2002	Nov 2002	Jan 2003	Apr 2003
GENERAL CHEMISTRY					
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	170
Bicarbonate	mg/L	NA	NA	NA	200
Chemical Oxygen Demand	mg/L	NA	NA	NA	290
Chloride	mg/L	NA	NA	NA	3.0
Dissolved Oxygen	mg/L	NA	NA	NA	9.4
Nitrate as N	mg/L	NA	NA	NA	5.1
Perchlorate	µg/L	ND	ND	ND	ND
Sulfate	mg/L	NA	NA	NA	18
Total Dissolved Solids	mg/L	NA	NA	NA	252
METALS					
Calcium	mg/L	NA	NA	NA	61
Magnesium	mg/L	NA	NA	NA	8.7
Sodium	mg/L	NA	NA	NA	15
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Acetone	µg/L	ND	ND	ND	**6.9**
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):					
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	NA	0.26

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 6 (CONT'D)
SUMMARY OF N-2 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jul 2003	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY							
Alkalinity as $CaCO_3$ (Total)	mg/L	NA	NC	NC	NC	NC	NC
Bicarbonate	mg/L	NA	NC	NC	NC	NC	NC
Chemical Oxygen Demand	mg/L	NA	NC	NC	NC	NC	NC
Chloride	mg/L	NA	NC	NC	NC	NC	NC
Dissolved Oxygen	mg/L	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	NA	NC	NC	NC	NC	NC
Perchlorate	µg/L	ND	NC	NC	NC	NC	NC
Sulfate	mg/L	NA	NC	NC	NC	NC	NC
Total Dissolved Solids	mg/L	NA	NC	NC	NC	NC	NC
METALS							
Calcium	mg/L	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	NC	NC	NC	NC	NC
Sodium	mg/L	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	ND	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 7
SUMMARY OF N-3 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N3-1 8/17/2002 401	N3-2 8/18/2002 441	N3-3 8/19/2002 477	N3-4 8/20/2002 507	PIEZO. N3-2in 9/14/2002 550	SOIL N3-1D 8/17/2002 410
GENERAL INORGANICS							
Perchlorate	µg/L	190	350	190	8.4	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	*11	ND	*2.0	**2.3**	13	NA
*** Chloroform	µg/L	*2.6	*4.8	ND	ND	ND	NA
1,1-Dichloroethane	µg/L	**0.30**	1.4	ND	ND	ND	NA
1,1-Dichloroethene	µg/L	4.0	14	ND	ND	ND	NA
1,2-Dichloropropane	µg/L	0.58	3.2	ND	ND	ND	NA
Dichlorodifluoromethane	µg/L	ND	**0.69**	ND	ND	ND	NA
*** Dibromochloromethane	µg/L	ND	ND	ND	**0.28**	ND	NA
*** Methylene Chloride	µg/L	ND	**0.53**	ND	ND	ND	NA
Tetrachloroethene	µg/L	3.7	12	ND	ND	ND	NA
*** Toluene	µg/L	ND	ND	ND	2.7	ND	NA
1,1,1-Trichloroethane	µg/L	3.2	9.6	ND	ND	ND	NA
Trichloroethene	µg/L	61	95	ND	ND	ND	NA
Trichlorofluoromethane	µg/L	ND	**0.69**	ND	ND	ND	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 7 (CONT'D)
SUMMARY OF N-3 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Oct 2002	Oct 2002	Nov 2002	Dec 2002	Jan 2003
GENERAL CHEMISTRY						
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	NA	NA
Bicarbonate	mg/L	NA	NA	NA	NA	NA
Chemical Oxygen Demand	mg/L	NA	NA	NA	NA	NA
Chloride	mg/L	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L	NA	NA	NA	NA	NA
Nitrate as N	mg/L	NA	NA	NA	NA	NA
Perchlorate	µg/L	1,000	1,000	750	580	440
Sulfate	mg/L	NA	NA	NA	NA	NA
Total Dissolved Solids	mg/L	NA	NA	NA	NA	NA
METALS						
Calcium	mg/L	NA	NA	NA	NA	NA
Magnesium	mg/L	NA	NA	NA	NA	NA
Sodium	mg/L	NA	NA	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Chloroform	µg/L	2.1	1.9	1.4	1.4	1.4
1,1-Dichloroethane	µg/L	4.0	**0.26**	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	3.8	2.7	2.4	2.0
1,2-Dichloropropane	µg/L	ND	0.60	ND	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	4.9	4.8	3.8	4.0	0.63
Toluene	µg/L	ND	**0.30**	ND	ND	ND
1,1,1-Trichloroethane	µg/L	2.7	2.5	1.7	1.4	1.2
Trichloroethene	µg/L	120	100	110	120	78
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):						
N-Nitrosodimethylamine (NDMA)	µg/L	NA	0.038	NA	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 7 (CONT'D)
SUMMARY OF N-3 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Feb 2003	Mar 2003	Apr 2003	May 2003	Jun 2003
GENERAL CHEMISTRY						
Alkalinity as CaCO3 (Total)	mg/L	NA	170	170	170	NA
Bicarbonate	mg/L	NA	200	210	210	NA
Chemical Oxygen Demand	mg/L	NA	4.8	ND	41	NA
Chloride	mg/L	NA	4.5	4.3	4.4	NA
Dissolved Oxygen	mg/L	NA	NA	10	8.2	NA
Nitrate as N	mg/L	NA	6.40	6.3	6.27	NA
Perchlorate	µg/L	430	270	190	160	120
Sulfate	mg/L	NA	11	11	11	NA
Total Dissolved Solids	mg/L	NA	246	252	266	NA
METALS						
Calcium	mg/L	NA	59	61	62	NA
Magnesium	mg/L	NA	9.3	9	9	NA
Sodium	mg/L	NA	13	11	11	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Chloroform	µg/L	1.1	1.1	1.2	1.2	1.6
1,1-Dichloroethane	µg/L	ND	**0.11**	**0.080**	ND	ND
1,1-Dichloroethene	µg/L	1.3	1.3	0.95	1.0	0.70
1,2-Dichloropropane	µg/L	**0.20**	**0.17**	ND	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND	**0.11**	**0.12**	**0.080**
Tetrachloroethene	µg/L	0.76	0.91	0.83	0.83	1.1
Toluene	µg/L	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	µg/L	0.69	0.72	0.56	**0.44**	**0.36**
Trichloroethene	µg/L	44	73	57	52	54
Trichlorofluoromethane	µg/L	ND	ND	**0.070**	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):						
N-Nitrosodimethylamine (NDMA)	µg/L	NA	0.26	0.25	0.26	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 7 (CONT'D)
SUMMARY OF N-3 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jul 2003	Sep 2003	Oct 2003	May 2004	Jun 2004
GENERAL CHEMISTRY						
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	NA	NA
Bicarbonate	mg/L	NA	NA	NA	NA	NA
Chemical Oxygen Demand	mg/L	NA	NA	NA	NA	NA
Chloride	mg/L	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L	NA	NA	NA	NA	NA
Nitrate as N	mg/L	NA	NA	NA	NA	NA
Perchlorate	μg/L	100	88	88	63	60
Sulfate	mg/L	NA	NA	NA	NA	NA
Total Dissolved Solids	mg/L	NA	NA	NA	NA	NA
METALS						
Calcium	mg/L	NA	NA	NA	NA	NA
Magnesium	mg/L	NA	NA	NA	NA	NA
Sodium	mg/L	NA	NA	NA	NA	NA
DETECTED VOLITILE ORGANIC COMPOUNDS (EPA 8260):						
*** Chloroform	μg/L	2.1	3.0	1.8	5.0	5.3
1,1-Dichloroethane	μg/L	ND	ND	ND	ND	0.094
1,1-Dichloroethene	μg/L	0.57	0.68	0.75	**0.47**	**0.46**
1,2-Dichloropropane	μg/L	ND	ND	ND	ND	0.083
Dichlorodifluoromethane	μg/L	ND	ND	**0.12**	ND	**0.12**
Tetrachloroethene	μg/L	1.4	1.2	1.3	1.9	1.3
Toluene	μg/L	ND	ND	**0.11**	ND	0.063
1,1,1-Trichloroethane	μg/L	**0.34**	**0.29**	**0.32**	**0.22**	**0.23**
Trichloroethene	μg/L	56	56	39	83	68
Trichlorofluoromethane	μg/L	ND	**0.080**	**0.11**	**0.15**	**0.17**
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):						
N-Nitrosodimethylamine (NDMA)	μg/L	NA	NA	NA	NA	NA

TABLE 7 (CONT'D)
SUMMARY OF N-3 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY							
Alkalinity as CaCO3 (Total)	mg/L	NA	170	170	0	170	170
Bicarbonate	mg/L	NA	210	207	6	200	210
Chemical Oxygen Demand	mg/L	NA	NC	NC	NC	NC	NC
Chloride	mg/L	NA	4	4	0.1	4.3	4.5
Dissolved Oxygen	mg/L	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	NA	6	6	0.1	6.27	6.4
Perchlorate	µg/L	69	175	338	330	60	1000
Sulfate	mg/L	NA	11	11	0	11	11
Total Dissolved Solids	mg/L	NA	252	255	10	246	266
METALS							
Calcium	mg/L	NA	61	61	2	59	62
Magnesium	mg/L	NA	9	9	0.2	9	9.3
Sodium	mg/L	NA	11	12	1	11	13
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Chloroform	µg/L	4.5	1.70	2.26	1.42	1.1	5.3
1,1-Dichloroethane	µg/L	0.25	0.19	1.11	1.93	0.08	4
1,1-Dichloroethene	µg/L	0.50	0.95	1.31	0.99	0.46	3.8
1,2-Dichloropropane	µg/L	0.16	0.20	0.32	0.24	0.17	0.6
Dichlorodifluoromethane	µg/L	0.20	0.12	0.11	0.02	0.08	0.12
Tetrachloroethene	µg/L	1.6	1.30	1.95	1.50	0.63	4.9
Toluene	µg/L	0.15	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	**0.18**	0.50	0.87	0.81	0.18	2.7
Trichloroethene	µg/L	55	62.50	72.81	26.61	39	120
Trichlorofluoromethane	µg/L	0.20	0.11	0.12	0.04	0.07	0.17
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 8
SUMMARY OF N-4 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS		SOIL	
ANALYTE	WELL ID DATE DEPTH (ft)	N4-2 8/29/2002 444	N4-2A 9/3/2002 463	N4-1D 8/28/2002 240	N4-2D 8/29/2002 401
GENERAL INORGANICS					
Perchlorate	µg/L	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Acetone	µg/L	17	13	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 8 (CONT'D)
SUMMARY OF N-4 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Nov 2002	Jan 2003	Apr 2003	Jul 2003	Oct 2003
GENERAL CHEMISTRY						
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	220	NA	NA
Bicarbonate	mg/L	NA	NA	270	NA	NA
Chemical Oxygen Demand	mg/L	NA	NA	71	NA	NA
Chloride	mg/L	NA	NA	49	NA	NA
Dissolved Oxygen	mg/L	NA	NA	9.3	NA	NA
Nitrate/Nitrite as N	mg/L	NA	NA	1.7	NA	NA
Perchlorate	µg/L	ND	ND	ND	ND	2.3
Sulfate	mg/L	NA	NA	98	NA	NA
Total Dissolved Solids	mg/L	NA	NA	418	NA	NA
METALS						
Calcium	mg/L	NA	NA	14	NA	NA
Magnesium	mg/L	NA	NA	4.2	NA	NA
Sodium	mg/L	NA	NA	150	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Acetone	µg/L	ND	ND	**7.0**	ND	ND
** Bromochloromethane	µg/L	ND	0.68	ND	ND	ND
** Bromodichloromethane	µg/L	1.4	1.1	**0.39**	ND	ND
** Bromoform	µg/L	**0.42**	ND	ND	ND	ND
** Chloroform	µg/L	0.77	1.1	**0.25**	ND	ND
** Dibromochloromethane	µg/L	2.7	1.3	**0.36**	ND	ND
*** Methylene Chloride	µg/L	ND	ND	ND	15	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):						
*** bis(2-Ethylexyl)phyhalate	µg/L	NA	NA	28	NA	NA
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	0.28	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 8 (CONT'D)
SUMMARY OF N-4 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NC	NC	NC	NC	NC
Bicarbonate	mg/L	NA	NA	NC	NC	NC	NC	NC
Chemical Oxygen Demand	mg/L	NA	NA	NC	NC	NC	NC	NC
Chloride	mg/L	NA	NA	NC	NC	NC	NC	NC
Dissolved Oxygen	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate/Nitrite as N	mg/L	NA	NA	NC	NC	NC	NC	NC
Perchlorate	µg/L	0.11	0.11	NC	NC	NC	NC	NC
Sulfate	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids	mg/L	NA	NA	NC	NC	NC	NC	NC
METALS								
Calcium	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Acetone	µg/L	ND	NA	NC	NC	NC	NC	NC
** Bromochloromethane	µg/L	0.058	0.13	NC	NC	NC	NC	NC
** Bromodichloromethane	µg/L	0.063	0.12	1.10	0.96	0.52	0.39	1.40
** Bromoform	µg/L	0.08	0.33	NC	NC	NC	NC	NC
** Chloroform	µg/L	0.069	**0.20**	0.51	0.58	0.43	0.20	1.10
** Dibromochloromethane	µg/L	0.071	0.11	1.30	1.45	1.18	0.36	2.70
*** Methylene Chloride	µg/L	0.22	0.43	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):								
*** bis(2-Ethylexyl)phyhalate	µg/L	NA	NA	NC	NC	NC	NC	NC
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 9
SUMMARY OF N-5 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID / DATE / DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS					
		N5-1 10/30/2002 406	N5-2 10/30/2002 420	N5-3 10/31/2002 445	N5-4 11/1/2002 487	N5-5 11/1/2002 585	N5-6 11/3/2002 585
GENERAL INORGANICS							
Perchlorate	µg/L	710	710	170	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	20	5.9	13	***6.9**	***11**	***11**
*** 2-Butanone (MEK)	µg/L	**1.6**	ND	ND	ND	ND	ND
*** Carbon Disulfide	µg/L	0.53	ND	ND	**0.37**	**0.42**	1.4
*** Chloroform	µg/L	3.0	2.6	0.52	ND	ND	ND
1,1-Dichloroethane	µg/L	**0.26**	2.4	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	5.0	ND	**0.43**	ND	ND	ND
1,2-Dichloropropane	µg/L	1.1	0.66	ND	ND	ND	ND
Dichlorodifluoromethane	µg/L	**0.50**	ND	ND	ND	ND	ND
*** Methylene Chloride	µg/L	**0.32**	ND	**0.21**	ND	ND	ND
Tetrachloroethene	µg/L	13	9.7	1.7	ND	ND	ND
*** Toluene	µg/L	ND	**0.47**	**0.45**	ND	ND	ND
1,1,1-Trichloroethane	µg/L	2.6	1.3	ND	ND	ND	ND
Trichloroethene	µg/L	730	ND	99	ND	ND	ND
Trichlorofluoromethane	µg/L	**0.63**	**0.28**	ND	ND	ND	ND

ANALYTE	WELL ID / DATE / DEPTH (ft)	SOIL: COMPOSITE SAMPLES					
		N-5 10/17/2002 5' - 50'	N-5 10/18/2002 55' - 100'	N5 10/18/2002 105' - 150'	N5 10/21/2002 155' - 200'	N-5 10/22/2002 205' - 250'	N5 10/23/2002 255' - 300'
GENERAL INORGANICS							
Perchlorate	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 9 (CONT'D)
SUMMARY OF N-5 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	SOIL: IN-SITU SAMPLES N5D-1 10/12/2002	N5D-2 10/12/2002	N5D-3 10/17/2002	N5D-4 10/18/2002	N5D-5 10/18/2002	N5D-6 10/18/2002	N5D-7 10/18/2002	N5D-8 10/21/2002
GENERAL INORGANICS									
Perchlorate	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
*** Acetone	µg/L	***52**	***49**	***47**	***44**	***54**	***42**	***50**	**43**
** Bromoform	µg/L	***4.8**	***4.6**	***5.9**	***5.1**	ND	***4.5**	***5.7**	***4.6**
*** 2-Butanone (MEK)	µg/L	***60**	***57**	***44**	***52**	***64**	***60**	***53**	***42**
*** Carbon Tetrachloride	µg/L	ND	ND	ND	ND	29	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	SOIL: IN-SITU SAMPLES N5D-9 10/21/2002	N5D-10 10/21/2002	N5D-11 10/22/2002	N5D-12 10/24/2002	N5D-13 10/23/2002	N5D-14 10/23/2002	N5D-15 10/24/2002	N5D-16 10/28/2002
GENERAL INORGANICS									
Perchlorate	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
*** Acetone	µg/L	**38**	ND	***36**	***36**	***36**	***43**	***50**	***44**
** Bromoform	µg/L	***5.3**	***5.7**	***6.3**	***5.6**	***6.1**	***6.4**	***5.2**	***5.3**
*** 2-Butanone (MEK)	µg/L	***46**	***38**	***34**	***54**	***36**	***50**	***48**	***34**
*** Carbon Tetrachloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	SOIL: IN-SITU SAMPLES N5D-17 10/28/2002	N5D-18 10/29/2002	N5D-19 10/29/2002	N5D-20 10/29/2002	N5D-21 10/29/2002	N5D-22 10/29/2002	N5D-23 10/29/2002
GENERAL INORGANICS								
Perchlorate	µg/L	ND	ND	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Acetone	µg/L	***38**	***34**	***44**	***39**	***40**	***50**	***58**
** Bromoform	µg/L	***5.4**	***6.1**	***5.0**	***5.3**	***5.2**	ND	***6.1**
*** 2-Butanone (MEK)	µg/L	***37**	***32**	***34**	***44**	***45**	***20**	***36**
*** Carbon Tetrachloride	µg/L	ND	ND	ND	ND	ND	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 9 (CONT'D)
SUMMARY OF N-5 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Nov 2002	Jan 2003	Jan 2003	Feb 2003	Mar 2003	Apr 2003
GENERAL CHEMISTRY							
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NA	NA	150	150
Bicarbonate	mg/L	NA	NA	NA	NA	180	180
Chemical Oxygen Demand	mg/L	NA	NA	NA	NA	12	ND
Chloride	mg/L	NA	NA	NA	NA	2.3	2.2
Dissolved Oxygen	mg/L	NA	NA	NA	NA	NA	11
Nitrate as N	mg/L	NA	NA	NA	NA	1.68	1.7
Perchlorate	µg/L	530	4.7	ND	ND	**1.3**	**2.2**
Sulfate	mg/L	NA	NA	NA	NA	18	17
Total Dissolved Solids	mg/L	NA	NA	NA	NA	170	206
METALS							
Calcium	mg/L	NA	NA	NA	NA	48	51
Magnesium	mg/L	NA	NA	NA	NA	7.7	7.4
Sodium	mg/L	NA	NA	NA	NA	9.9	11
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	***1.3**	**1.5**	ND	ND	ND	ND
*** Chloroform	µg/L	2.6	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	**0.28**	**0.26**	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	4.3	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	0.90	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/L	**0.68**	ND	ND	ND	ND	ND
*** Methylene Chloride	µg/L	**0.30**	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	10	ND	ND	**0.32**	**0.15**	**0.090**
1,1,1-Trichloroethane	µg/L	2.2	ND	ND	ND	ND	ND
Trichloroethene	µg/L	440	1.8	ND	**0.25**		ND
Trichlorofluoromethane	µg/L	**0.60**	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	NA	NA	0.25	0.25

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 9 (CONT'D)
SUMMARY OF N-5 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	May 2003	Jun 2003	Jul 2003	Aug 2003	Sep 2003	Oct 2003
GENERAL CHEMISTRY							
Alkalinity as CaCO3 (Total)	mg/L	150	NA	NA	NA	NA	NA
Bicarbonate	mg/L	180	NA	NA	NA	NA	NA
Chemical Oxygen Demand	mg/L	25	NA	NA	NA	NA	NA
Chloride	mg/L	2.3	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L	8.7	NA	NA	NA	NA	NA
Nitrate as N	mg/L	1.68	NA	NA	NA	NA	NA
Perchlorate	µg/L	**3.3**	4.7	4.7	5.3	6.3	8.5
Sulfate	mg/L	18	NA	NA	NA	NA	NA
Total Dissolved Solids	mg/L	218	NA	NA	NA	NA	NA
METALS							
Calcium	mg/L	51	NA	NA	NA	NA	NA
Magnesium	mg/L	7.5	NA	NA	NA	NA	NA
Sodium	mg/L	10	NA	NA	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	ND	ND	ND	ND	ND	ND
*** Chloroform	µg/L	ND	**0.28**	ND	ND	ND	**0.32**
1,1-Dichloroethane	µg/L	ND	**0.41**	**0.17**	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	0.81
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND	ND	ND	ND	ND
*** Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	ND	**0.24**	**1.1**	**0.17**	ND	**0.19**
1,1,1-Trichloroethane	µg/L	ND	**0.24**	ND	ND	ND	ND
Trichloroethene	µg/L	**0.27**	1.6	ND	0.88	ND	1.6
Trichlorofluoromethane	µg/L	ND	ND	ND	ND	ND	ND
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):							
N-Nitrosodimethylamine (NDMA)	µg/L	0.26	NA	NA	NA	NA	NA

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 9 (CONT'D)
SUMMARY OF N-5 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Alkalinity as CaCO3 (Total)	mg/L	NA	NA	NC	NC	NC	NC	NC
Bicarbonate	mg/L	NA	NA	NC	NC	NC	NC	NC
Chemical Oxygen Demand	mg/L	NA	NA	NC	NC	NC	NC	NC
Chloride	mg/L	NA	NA	NC	NC	NC	NC	NC
Dissolved Oxygen	mg/L	NA	NA	NC	NC	NC	NC	NC
Nitrate as N	mg/L	NA	NA	NC	NC	NC	NC	NC
Perchlorate	µg/L	8.7	10	NC	NC	NC	NC	NC
Sulfate	mg/L	NA	NA	NC	NC	NC	NC	NC
Total Dissolved Solids	mg/L	NA	NA	NC	NC	NC	NC	NC
METALS								
Calcium	mg/L	NA	NA	NC	NC	NC	NC	NC
Magnesium	mg/L	NA	NA	NC	NC	NC	NC	NC
Sodium	mg/L	NA	NA	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Acetone	µg/L	NA	NA	NC	NC	NC	NC	NC
*** Chloroform	µg/L	0.19	0.11	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	0.094	0.13	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	0.054	0.11	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	0.083	0.16	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	0.11	0.20	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	0.17	0.43	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	**0.26**	0.15	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	0.061	0.16	NC	NC	NC	NC	NC
Trichloroethene	µg/L	0.75	0.55	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	0.06	0.20	NC	NC	NC	NC	NC
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270):								
N-Nitrosodimethylamine (NDMA)	µg/L	NA	NA	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 10
SUMMARY OF N-6 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N-6-1 5/16/2003 412	N-6-2 5/19/2003 427	N-6-3 5/19/2003 439	N-6-4 5/22/2003 464	N-6-5 6/18/2003 524	SOIL N-6/D-1 5/16/2003 345	N-6/D-2 5/16/2003 365
GENERAL CHEMISTRY								
Perchlorate	µg/L	8.3	2.6	1.0	0.59	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
cis-1,2-Dichloroethene	µg/L	**0.11**	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	6.5	*15	**0.01**	**0.011**
Toluene	µg/L	ND	ND	ND	ND	**0.35**	ND	ND
Trichloroethene	µg/L	1.5	0.52	ND	ND	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: MONITORING WELLS N-6-2" 6/18/2003 524	N-6 -4" 6/18/2003 412-422, 427-432
GENERAL CHEMISTRY			
Perchlorate	µg/L	ND	1.5
VOLATILE ORGANIC COMPOUNDS (EPA 8260):			
cis-1,2-Dichloroethene	µg/L	ND	ND
*** Methylene Chloride	µg/L	*15	ND
*** Toluene	µg/L	**0.35**	ND
Trichloroethene	µg/L	ND	0.51

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 10 (CONT'D)
SUMMARY OF N-6 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jul-2003	Aug-2003	Sep-2003	Oct-2003	May-2004
GENERAL INORGANICS						
Perchlorate	µg/L	2.0	1.6	1.5	1.6	2.4
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
Trichloroethene	µg/L	0.60	0.52	**0.36**	**0.40**	0.59

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 10 (CONT'D)
SUMMARY OF N-6 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun-2004	Jul-2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS								
Perchlorate	µg/L	2.9	5.7	2.00	2.53	1.49	1.5	5.7
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
Trichloroethene	µg/L	0.88	1.3	0.59	0.66	0.33	0.36	1.3

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 11
SUMMARY OF N-7 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N-7-1 4/14/2003 383	N-7-2 4/14/2003 407	N-7-3 4/14/2003 428	N-7-4 4/16/2003 488	N-7-5 4/17/2003 520	SOIL N-7/D-1 4/11/2003 325	N-7/D-2 4/11/2003 340
GENERAL CHEMISTRY								
Perchlorate	µg/L	ND	**0.72**	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
1,2-Dichloropropane	µg/L	ND	**0.31**	ND	ND	ND	ND	ND
*** Methylene Chloride	µg/L	ND	**0.24**	**0.12**	6.6	12	ND	ND
Tetrachloroethene	µg/L	ND	**0.18**	ND	ND	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: MONITORING WELLS N-7 2" 04/25/03 530	N-7 4" 04/25/03 410
GENERAL CHEMISTRY			
Perchlorate	µg/L	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):			
** Bromodichloromethane	µg/L	**0.92**	ND
*** Chloroform	µg/L	2.2	ND
1,1-Dichloroethane	µg/L	ND	ND
1,2-Dichloropropane	µg/L	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND
Hexachlorobutadiene	µg/L	**0.53**	ND
*** Methylene Chloride	µg/L	6.4	ND
Tetrachloroethene	µg/L	ND	**0.25**
*** Toluene	µg/L	2.6	ND
Trichloroethene	µg/L	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 11 (CONT'D)
SUMMARY OF N-7 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun-2003	Jul-2003	Aug-2003	Sep-2003	Oct-2003
GENERAL CHEMISTRY						
Perchlorate	µg/L	ND	ND	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
** Bromodichloromethane	µg/L	ND	ND	ND	ND	ND
*** Chloroform	µg/L	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND
1,2-Dichloropropane	µg/L	ND	ND	ND	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND	ND	ND	**0.080**
Hexachlorobutadiene	µg/L	ND	ND	ND	ND	ND
*** Methylene Chloride	µg/L	ND	ND	ND	ND	ND
Tetrachloroethene	µg/L	**0.31**	**0.24**	**0.30**	**0.22**	**0.20**
*** Toluene	µg/L	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 11 (CONT'D)
SUMMARY OF N-7 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun-2004	Jul-2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Perchlorate	µg/L	**1.6**	**2.0**	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
** Bromodichloromethane	µg/L	0.086	0.12	NC	NC	NC	NC	NC
*** Chloroform	µg/L	0.19	0.11	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	**0.14**	**0.18**	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	1.2	1.7	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	0.11	0.20	NC	NC	NC	NC	NC
Hexachlorobutadiene	µg/L	0.088	0.23	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	1.0	0.43	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	0.65	0.85	0.30	0.40	0.25	0.20	0.85
*** Toluene	µg/L	0.063	0.15	NC	NC	NC	NC	NC
Trichloroethene	µg/L	**0.49**	0.52	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 12
SUMMARY OF N-8 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N-8-1 4/21/2003 398	N-8-2 4/29/2003 423	N-8-3 4/29/2003 447	N-8-4 5/1/2003 470	N-8-5 5/2/2003 525	SOIL N-8/D-1 4/28/2003 345	N-8/D-2 4/28/2003 360
GENERAL CHEMISTRY								
Perchlorate	µg/L	67	190	270	160	3.1	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Chloroform	µg/L	ND	**0.75**	**0.44**	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	**0.47**	**0.44**	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	**0.76**	**0.89**	0.45	ND	ND	ND
1,2-Dichloropropane	µg/L	4.3	3.3	1.7	1.9	ND	ND	ND
*** Methylene Chloride	µg/L	5.4	5.9	5.0	1.9	ND	ND	ND
Tetrachloroethene	µg/L	1.2	1.6	1.4	0.91	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	**0.76**	**0.62**	ND	ND	ND	ND
Trichloroethene	µg/L	**0.80**	7.3	8.3	3.5	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: MONITORING WELLS N-8 2" 05/02/03 527	N-8 4" 05/30/03 461
GENERAL CHEMISTRY			
Perchlorate	µg/L	3.1	190
VOLATILE ORGANIC COMPOUNDS (EPA 8260):			
*** Chloroform	µg/L	ND	0.52
cis-1,2-Dichloroethene	µg/L	ND	ND
1,1-Dichloroethane	µg/L	ND	0.59
1,1-Dichloroethene	µg/L	ND	ND
1,2-Dichloropropane	µg/L	ND	2.4
*** Dichlorodifluoromethane	µg/L	ND	ND
Methylene Chloride	µg/L	ND	1.5
Methyl iodide	µg/L	ND	ND
Tetrachloroethene	µg/L	ND	2.1
1,1,1-Trichloroethane	µg/L	ND	0.72
Trichloroethene	µg/L	ND	9.7
Trichlorofluoromethane	µg/L	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 12 (CONT'D)
SUMMARY OF N-8 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun 2003	Jul 2003	Aug 2003	Sep 2003	Oct 2003	May 2004
GENERAL CHEMISTRY							
Perchlorate	µg/L	200	310	350	350	380	340
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Chloroform	µg/L	0.79	0.75	0.79	0.98	1.1	2.0
cis-1,2-Dichloroethene	µg/L	**0.13**	**0.32**	**0.26**	**0.21**	**0.16**	**0.19**
1,1-Dichloroethane	µg/L	**0.30**	**0.45**	**0.43**	**0.42**	**0.46**	**0.36**
1,1-Dichloroethene	µg/L	**0.72**	**2.3**	1.9	2.2	2.9	2.3
1,2-Dichloropropane	µg/L	2.1	2.9	2.4	2.5	2.7	1.80
*** Dichlorodifluoromethane	µg/L	ND	ND	**0.23**	**0.16**	**0.30**	**0.37**
Methylene Chloride	µg/L	1.1	1.5	1.4	1.6	1.5	0.91
Methyl iodide	µg/L	ND	2.1	ND	ND	ND	N/A
Tetrachloroethene	µg/L	1.5	3.2	2.0	1.2	2.4	4.1
1,1,1-Trichloroethane	µg/L	0.63	1.2	1.1	1.2	1.3	1.2
Trichloroethene	µg/L	7.80	23	22	19	37	76
Trichlorofluoromethane	µg/L	ND	**0.25**	**0.21**	**0.19**	**0.27**	**0.28**
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 12 (CONT'D)
SUMMARY OF N-8 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL CHEMISTRY								
Perchlorate	µg/L	380	380	350	336	60	200	380
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Chloroform	µg/L	2.3	1.9	1.04	1.33	0.63	0.75	2.3
cis-1,2-Dichloroethene	µg/L	**0.17**	0.19	0.19	0.21	0.07	0.13	0.32
1,1-Dichloroethane	µg/L	**0.41**	**0.33**	0.42	0.40	0.06	0.3	0.46
1,1-Dichloroethene	µg/L	2.9	2.1	2.25	2.17	0.68	0.72	2.9
1,2-Dichloropropane	µg/L	2.0	1.5	2.25	2.24	0.47	1.5	2.9
*** Dichlorodifluoromethane	µg/L	**0.47**	0.20	0.30	0.31	0.12	0.16	0.47
Methylene Chloride	µg/L	**0.86**	0.43	1.40	1.27	0.30	0.86	1.6
Methyl iodide	µg/L	N/A	N/A	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	3.9	3.5	2.80	2.73	1.11	1.2	4.1
1,1,1-Trichloroethane	µg/L	1.3	0.95	1.20	1.11	0.22	0.63	1.3
Trichloroethene	µg/L	**78**	67	30.00	41.23	28.18	7.8	78
Trichlorofluoromethane	µg/L	**0.35**	**0.23**	0.25	0.25	0.05	0.19	0.35
1,1,2-Trichloro-1,2,2-trifluoroethane	µg/L	ND	**0.44**	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 13
SUMMARY OF N-9 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N-9-1 5/16/2003 397-400	N-9-2 5/16/2003 414-419	N-9-3 5/16/2003 437-442	N-9-4 5/19/2003 465-470	N-9-5 5/20/2003 525-530	SOIL N-9/D-1 5/16/2003 340	N-9/D-2 5/16/2003 360
GENERAL CHEMISTRY								
Perchlorate	µg/L	39	49	75	90	ND	ND	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Chloroform	µg/L	**0.27**	**0.25**	**0.41**	**0.43**	ND	ND	ND
Dichlorodifluoromethane	µg/L	ND	ND	**0.40**	**0.40**	ND	ND	ND
1,1-Dichloroethane	µg/L	0.59	0.52	0.58	**0.44**	ND	ND	ND
1,2-Dichloroethane	µg/L	**0.12**	**0.14**	ND	ND	ND	ND	ND
1,1-Dichloreoethene	µg/L	**0.13**	**0.11**	0.80	0.76	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	**0.26**	**0.21**	**0.31**	**0.22**	ND	ND	ND
1,2-Dichloropropane	µg/L	4.0	3.7	4.0	3.3	ND	ND	ND
*** Methylene Chloride	µg/L	1.3	1.6	3.1	2.7	ND	**0.01**	**0.01**
Tetrachloroethene	µg/L	2.2	2.3	2.0	2.0	ND	ND	ND
1,1,1-Trichloroethane	µg/L	ND	**0.14**	**0.47**	0.58	ND	ND	ND
Trichloroethene	µg/L	0.79	1.5	5.2	6.2	ND	ND	ND
Trichlorofluoromethane	µg/L	**0.11**	**0.11**	ND	**0.22**	ND	ND	ND

ANALYTE	WELL ID DATE DEPTH (ft)	GROUNDWATER: MONITORING WELLS N-9-2" 5/29/2003 520-530	N-9-4" 5/29/2003 460-470	N-9-2" 5/28/2004 520-530
GENERAL CHEMISTRY				
Perchlorate	µg/L	ND	DRY	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):				
Methylene Chloride	µg/L	ND	DRY	4.4

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 13 (CONT'D)
SUMMARY OF N-9 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL (DRY SINCE INSTALLATION)

ANALYTE	UNITS	May 2003	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS							
Perchlorate	µg/L	DRY	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	DRY	NC	NC	NC	NC	NC
*** Chloroform	µg/L	DRY	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	DRY	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	DRY	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	DRY	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	µg/L	DRY	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	DRY	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	DRY	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	DRY	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	DRY	NC	NC	NC	NC	NC
*** Toluene	µg/L	DRY	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	DRY	NC	NC	NC	NC	NC
Trichloroethene	µg/L	DRY	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	DRY	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 14
SUMMARY OF N-10 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

ANALYTE	WELL ID / DATE / DEPTH (ft)	GROUNDWATER: TEMPORARY WELLS N-10-W1 7/24/2003 368.85-375	N-10-W2 7/25/2003 402.5-407.5	N-10-W3 7/28/2003 439-444	N-10-W4 7/28/2003 455-460	N-10-W5 7/30/2003 473	SOIL N-10/D1 7/23/2003 363
GENERAL CHEMISTRY							
Perchlorate	µg/L	**1.6**	190	36	190	150	ND
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
1,2-Dichloropropane	µg/L	ND	ND	ND	**0.42**	ND	ND
*** Methylene Chloride	µg/L	ND	ND	3.8	2.4	2.1	ND
*** Toluene	µg/L	ND	**0.070**	ND	ND	ND	ND
Trichloroethene	µg/L	ND	**0.18**	**0.35**	0.53	ND	ND

ANALYTE	WELL ID / DATE / DEPTH (ft)	GROUNDWATER: MONITORING WELLS N-10-2" 8/22/2003 405-435	N-10-4" 8/22/2003 546-556
GENERAL CHEMISTRY			
Perchlorate	µg/L	160	16
VOLATILE ORGANIC COMPOUNDS (EPA 8260):			
*** Chloroform	µg/L	**0.17**	ND
1,1-Dichloroethane	µg/L	**0.25**	ND
1,2-Dichloroethane	µg/L	**0.32**	ND
1,2-Dichloropropane	µg/L	1.4	ND
*** Methylene Chloride	µg/L	**0.87**	ND
Tetrachloroethene	µg/L	0.90	ND
1,1,1-Trichloroethane	µg/L	**0.23**	ND
Trichloroethene	µg/L	2.5	ND

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 14 (CONT'D)
SUMMARY OF N-10 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Sep 2003	Oct 2003	May 2004	Jun 2004
GENERAL INORGANICS					
Perchlorate	µg/L	82	110	120	100
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Chloroform	µg/L	ND	ND	ND	0.19
1,1-Dichloroethane	µg/L	ND	ND	0.18	**0.19**
1,1-Dichloroethene	µg/L	ND	ND	0.24	**0.22**
1,2-Dichloropropane	µg/L	ND	**0.19**	0.97	0.98
cis-1,2-Dichloroethene	µg/L	ND	ND	ND	0.12
Dichlorodifluoromethane	µg/L	ND	ND	ND	0.11
*** Dibromochloromethane	µg/L	ND	ND	ND	0.06
*** Methylene Chloride	µg/L	**0.13**	**0.24**	0.68	**0.56**
Tetrachloroethene	µg/L	ND	ND	0.69	0.51
*** Toluene	µg/L	ND	ND	ND	0.063
1,1,1-Trichloroethane	µg/L	ND	ND	ND	**0.13**
Trichloroethene	µg/L	**0.20**	**0.28**	2.80	2.0
Trichlorofluoromethane	µg/L	ND	ND	ND	0.06

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 14 (CONT'D)
SUMMARY OF N-10 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS							
Perchlorate	µg/L	110	110	104	14	82	120
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Chloroform	µg/L	0.11	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	0.17	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	0.15	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	0.96	0.97	0.78	0.39	0.19	0.98
cis-1,2-Dichloroethene	µg/L	0.15	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	0.098	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	0.10	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	**0.65**	0.56	0.45	0.25	0.13	0.68
Tetrachloroethene	µg/L	**0.46**	0.51	0.55	0.12	0.46	0.69
*** Toluene	µg/L	0.12	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	0.12	NC	NC	NC	NC	NC
Trichloroethene	µg/L	2.3	2.00	1.52	1.20	0.20	2.8
Trichlorofluoromethane	µg/L	0.094	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 15
SUMMARY OF N-11 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS				
ANALYTE	WELL ID DATE DEPTH (ft)	11-1 04/29/04 415	11-2 04/30/04 475-478	11-3 05/03/04 501-506	11-4 05/05/04 578-581	11-5 05/06/04 618-620
GENERAL CHEMISTRY						
Perchlorate-primary	µg/L	8.1	**3.0**	0.11	0.11	0.11
Perchlorate-split	µg/L	6.0	**3.8**	NA	NA	NA
VOLATILE ORGANIC COMPOUNDS (EPA 8260):						
*** Methylene Chloride	µg/L	**0.64**	0.31	**0.58**	0.16	0.16
Trichloroethene	µg/L	**0.36**	0.23	0.12	0.12	0.12

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 15 (CONT'D)
SUMMARY OF N-11 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	May 2004	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS									
Perchlorate	µg/L	2.50	2.70	5.1	3	3	1	2.5	5.1
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
Benzene	µg/L	0.23	0.060	0.12	NC	NC	NC	NC	NC
*** Chloroform	µg/L	ND	0.190	0.11	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	ND	0.094	0.13	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	ND	0.054	0.11	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	ND	0.083	0.16	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	µg/L	ND	0.120	0.19	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	ND	0.110	0.20	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	ND	ND	0.11	NC	NC	NC	NC	NC
Isopropylbenzene	µg/L	0.25	0.160	0.14	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	ND	0.170	0.43	NC	NC	NC	NC	NC
Methyl t-butyl ether	µg/L	20.00	0.076	NA	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	ND	0.092	0.15	NC	NC	NC	NC	NC
*** Toluene	µg/L	ND	0.063	0.15	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	ND	0.061	0.16	NC	NC	NC	NC	NC
Trichloroethene	µg/L	ND	**0.17**	0.18	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	ND	0.060	0.20	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 16
SUMMARY OF N-12 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS		
ANALYTE	WELL ID DATE DEPTH (ft)	12-1 05/11/04 406	12-2 05/11/04 418-419	12-3 05/12/04 441-445
GENERAL CHEMISTRY				
Perchlorate-primary	µg/L	160	190	200
Perchlorate-split	µg/L	200	190	210
VOLATILE ORGANIC COMPOUNDS (EPA 8260):				
*** Chloroform	µg/L	**0.42**	0.21	0.58
1,1-Dichloroethane	µg/L	**0.22**	0.34	**0.41**
1,2-Dichloroethane	µg/L	0.13	0.26	**0.10**
1,1-Dichloroethene	µg/L	0.15	0.29	1.1
1,2-Dichloropropane	µg/L	1.9	1.4	2.4
cis-1,2-Dichloroethene	µg/L	0.15	0.30	**0.16**
Dichlorodifluoromethane	µg/L	0.10	0.20	**0.37**
*** Methylene Chloride	µg/L	0.16	0.31	**0.62**
Tetrachloroethene	µg/L	1.6	1.2	2.6
1,1,1-Trichloroethane	µg/L	0.12	0.24	0.51
Trichloroethene	µg/L	29	8.6	32
Trichlorofluoromethane	µg/L	0.10	0.19	**0.24**

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 16 (CONT'D)
SUMMARY OF N-12 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	May 2004	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS									
Perchlorate	µg/L	240	240	220	240	233	12	220	240
VOLATILE ORGANIC COMPOUNDS (EPA 8260):									
*** Acetone	µg/L	ND	ND	NA	NC	NC	NC	NC	NC
Bromochloromethane	µg/L	ND	**0.10**	0.13	NC	NC	NC	NC	NC
*** Chloroform	µg/L	0.41	0.54	**0.33**	0.41	0.43	0.11	0.33	0.54
1,1-Dichloroethane	µg/L	0.33	**0.45**	**0.35**	0.35	0.38	0.06	0.33	0.45
1,1-Dichloroethene	µg/L	0.34	0.58	**0.31**	0.34	0.41	0.15	0.31	0.58
1,2-Dichloropropane	µg/L	2.10	2.6	2.2	2.2	2.3	0.26	2.1	2.6
cis-1,2-Dichloroethene	µg/L	0.15	0.12	0.19	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	0.51	0.65	0.20	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	ND	0.12	0.11	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	ND	0.17	0.43	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	3.00	2.6	2.3	2.6	2.6	0.35	2.3	3
*** Toluene	µg/L	ND	0.06	0.15	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	0.25	**0.27**	**0.21**	0.25	0.24	0.03	0.21	0.27
Trichloroethene	µg/L	28	32	18	28	26	7	18	32
Trichlorofluoromethane	µg/L	0.23	**0.27**	0.20	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 17
SUMMARY OF N-13 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS			
ANALYTE	WELL ID DATE DEPTH (ft)	13-1 05/24/04 383	13-2 05/26/04 486	13-3 05/28/04 539	13-4 06/01/04 560-565
GENERAL CHEMISTRY					
Perchlorate-primary	µg/L	21	**2.3**	**2.3**	0.11
Perchlorate-split	µg/L	20	1.4	**1.8**	1.4
VOLATILE ORGANIC COMPOUNDS (EPA 8260):					
*** Chloroform	µg/L	**0.12**	0.19	0.19	0.11
1,1-Dichloroethane	µg/L	**0.48**	0.17	0.31	0.17
1,2-Dichloropropane	µg/L	5.5	0.15	0.19	0.11
cis-1,2-Dichloroethene	µg/L	**0.18**	0.19	0.27	0.15
*** Methylene Chloride	µg/L	0.16	2.7	6.0	0.16
Tetrachloroethene	µg/L	1.3	0.15	0.20	0.12
Trichloroethene	µg/L	1.4	0.18	0.21	0.12

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 17 (CONT'D)
SUMMARY OF N-13 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Jun 2004	Jul 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS								
Perchlorate	µg/L	0.11	0.11	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):								
*** Acetone	µg/L	ND	ND	NC	NC	NC	NC	NC
Bromochloromethane	µg/L	**0.38**	0.14	NC	NC	NC	NC	NC
*** Chloroform	µg/L	0.58	**0.20**	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	0.086	0.17	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	0.054	0.15	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	0.097	0.11	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	µg/L	0.120	0.15	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	0.110	0.098	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	**0.35**	0.10	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	0.170	0.16	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	0.092	0.12	NC	NC	NC	NC	NC
*** Toluene	µg/L	0.063	0.12	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	0.061	0.12	NC	NC	NC	NC	NC
Trichloroethene	µg/L	0.070	0.12	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	0.060	0.094	NC	NC	NC	NC	NC

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 18
SUMMARY OF N-14 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS					
ANALYTE	WELL ID DATE DEPTH (ft)	14-1 6/15/2004 414	14-2 6/16/2004 446-447	14-3 6/17/2004 477-480	14-4 6/18/2004 509-511	14-5 6/22/2004 555-557	14-6 6/25/2004 605
GENERAL CHEMISTRY							
Perchlorate-primary	µg/L	26	16	5.6	**3.5**	7.5	7.6
Perchlorate-split	µg/L	22	14	4.5	1.4	7.6	6.0
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Methylene Chloride	µg/L	8.4	2.2	1.4	0.16	0.16	6.6

Notes:

* = Indicates compound was detected in an accompanying blank sample.
** = Treated (Municipal) water constituent.
*** = Probable laboratory contaminant.
NA = Not analyzed.
ND = Not detected above the MDL.
NR = Not reported.
Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 18 (CONT'D)
SUMMARY OF N-14 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Aug 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS							
Perchlorate	µg/L	Pending	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	Pending	NC	NC	NC	NC	NC
Bromochloromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Chloroform	µg/L	Pending	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	Pending	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	Pending	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	Pending	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	Pending	NC	NC	NC	NC	NC
*** Toluene	µg/L	Pending	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	Pending	NC	NC	NC	NC	NC
Trichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	Pending	NC	NC	NC	NC	NC

Notes:

Pending = Well N-14 was sampled for the first time on August 30, 2004; analytical results were pending at the time of publication.

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 19
SUMMARY OF N-15 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

		GROUNDWATER: TEMPORARY WELLS						
ANALYTE	WELL ID DATE DEPTH (ft)	15-1 7/14/2004 378	15-2 7/15/2004 396-398	15-3 7/16/2004 444	15-4 7/16/2004 475	15-5 7/19/2004 516-519	15-6 7/20/2004 575	15-7 7/21/2004 600
GENERAL CHEMISTRY								
Perchlorate-primary	μg/L	0.11	0.11	0.11	0.11	0.11	0.11	0.11
Perchlorate-split	μg/L	1.4	1.4	1.4	1.4	1.4	**PENDING**	**PENDING**
VOLATILE ORGANIC COMPOUNDS (EPA 8260): ND								

Notes:

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 19 (CONT'D)
SUMMARY OF N-15 ANALYTICAL RESULTS
INVESTIGATION OF PERCHLORATE IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

GROUNDWATER: PERMANENT WELL

ANALYTE	UNITS	Aug 2004	MED.	AVG.	STD. DEV.	MIN.	MAX.
GENERAL INORGANICS							
Perchlorate	µg/L	Pending	NC	NC	NC	NC	NC
VOLATILE ORGANIC COMPOUNDS (EPA 8260):							
*** Acetone	µg/L	Pending	NC	NC	NC	NC	NC
Bromochloromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Chloroform	µg/L	Pending	NC	NC	NC	NC	NC
1,1-Dichloroethane	µg/L	Pending	NC	NC	NC	NC	NC
1,1-Dichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
1,2-Dichloropropane	µg/L	Pending	NC	NC	NC	NC	NC
cis-1,2-Dichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
Dichlorodifluoromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Dibromochloromethane	µg/L	Pending	NC	NC	NC	NC	NC
*** Methylene Chloride	µg/L	Pending	NC	NC	NC	NC	NC
Tetrachloroethene	µg/L	Pending	NC	NC	NC	NC	NC
*** Toluene	µg/L	Pending	NC	NC	NC	NC	NC
1,1,1-Trichloroethane	µg/L	Pending	NC	NC	NC	NC	NC
Trichloroethene	µg/L	Pending	NC	NC	NC	NC	NC
Trichlorofluoromethane	µg/L	Pending	NC	NC	NC	NC	NC

Notes:

Pending = Well N-15 was sampled for the first time on August 30, 2004; analytical results were pending at the time of publication.

* = Indicates compound was detected in an accompanying blank sample.

** = Treated (Municipal) water constituent.

*** = Probable laboratory contaminant.

NA = Not analyzed.

ND = Not detected above the MDL.

NR = Not reported.

Bold, Shaded & Right Justified = Detected between the PQL & MDL.

TABLE 20
SUMMARY OF POTENTIAL ARARs
RIALTO TREATMENT SYSTEM, CA

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
POTENTIAL CHEMICAL-SPECIFIC ARARs			
Safe Drinking Water Act (SDWA)	42 USC 300f *et seq.* 40 CFR 141	The SDWA is the main federal law that ensures the quality of Americans' drinking water. Under SDWA, EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards.	Applicable to All Alternatives
Clean Air Act (CAA)			
a. National Primary and Secondary Ambient Air Quality Standards (NAAQS)	40 CFR 50-80	The CAA regulates air emissions of substances that may harm public health. Air pollutants that may be of concern at the site during remedial activities are listed below, along with primary NAAQS standards: PM^{10} (particulate matter, diameter 10 micrometer [µm] or less) annual - 50 micrograms per cubic meters (µg/m^3) 24-hour - 150 µg/m^3 Cleanup of the site is not likely to result in classification as a "major source" under the CAA unless emissions equal or exceed 100 tons per year (tpy) of the pollutants for which the area is designated non-attainment. State implementation plans contain the specific regulations which govern the emission rates for such areas.	During Construction, Applicable to All Alternatives
b. National Emission Standards for Hazardous Air Pollutants (NESHAP)	42 USC 7401 *et seq.*	NESHAP is established on an industry- and process-specific basis and must provide "an ample margin of safety to protect public health." All major stationary and area sources that emit or have potential to emit 10 tpy of any single hazardous air pollutant (HAP), or a total of 25 tpy of a combination of HAPs must comply with emission standards for that industry and HAP. This site contains some of the chemicals of concern, which are listed as HAPS, however, it is very unlikely that the releases from the site will reach the 10 or 25 tpy threshold.	During Construction, Applicable to All Alternatives
Hazardous Waste Control Act (HWCA), as administered by the Department of Toxic Substances Control (DTSC)	22 CCR 6620 *et seq.*	The HWCA mandates the control of hazardous wastes from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.	
a. Criteria for Identifying Characteristics of Hazardous Wastes	22 CCR 66261.10 *et seq.*	Tests must be performed on chemicals to identify hazardous characteristics. If a chemical if either listed or tested and found hazardous, then remedial alternatives must comply with the hazardous waste management requirements.	Applicable to All Alternatives
b. Categories of Hazardous Wastes	22 CCR 66261.100 *et seq.*	In addition to listing the four RCRA hazardous waste characteristics (reactivity, corrosivity, ignitability, and the Toxicity Characteristics Leachate Procedure [TCLP], the HWCA regulations have established two other criteria: Total Threshold Limit Concentration (TTLC) and Soluble Threshold Limit Concentration (STLC) If a chemical is either listed or tested and found hazardous, then remedial alternatives must comply with the hazardous waste management requirements.	Applicable to All Alternatives

Table 20 (Continued)
SUMMARY OF POTENTIAL ARARs

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
a. State Water Resources Control Board (SWRCB) Resolution 88-63	SWRCB Res. 88-63	This resolution addresses site-specific conditions that should be considered in determining appropriate beneficial uses for ground water beneath the site. Ground water with solids concentrations exceeding 3,000 milligrams per liter (mg/l) and/or sustained yield less than 200 gallons per day should not be considered as a source of drinking water.	Applicable to All Alternatives
b. SWRCB Resolution 68-16	SWRCB Res. 68-16	This resolution requires maintenance of existing water quality unless it is demonstrated that a change will benefit the people of the State, will not unreasonably affect present or potential uses, and will not result in water quality less than that prescribed by other state policies. Further, the resolution requires that any activity that discharges waste to high quality water be required to meet waste discharge requirements. This policy is applicable to identifying appropriate ground water quality criteria for ground water beneath the site.	Applicable to All Alternatives
POTENTIAL LOCATIONS-SPECIFIC ARARs			
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 *et seq.* 40 CFR 240-271	RCRA establishes standards for the generation, management, and disposal of solid and hazardous waste. RCRA has limited application as an ARAR for alternative remedial actions at the site. Certain remedial actions may include generation and disposal of solid or hazardous waste subject to RCRA requirements.	Applicable to All Alternatives but Especially Alt. 3 and 4
Clean Water Act (CWA)	33 USC 1251 *et seq.* 40 CFR 100-140, 400-470	The CWA regulates the discharge of nontoxic and toxic pollutants into surface water by specific and non-specific sources. The CWA also specifies water quality criteria requirements for state water quality standards based on these criteria, and wetlands regulations.	Applicable to All Alternatives but Especially Alt. 3
Endangered Species Act	16 USC 1531 *et seq.* 40 CFR 6.302 50 CFR 17, 200, 402	The Endangered Species Act protects listed species and their habitat in the area of the proposed remedial action. To the extent such species are present at the site, this requirement is potentially applicable.	Applicable to All Alternatives but Especially Alt. 3
Fish and Wildlife Coordination Act	16 USC 661 *et seq.* 33 CFR 320-330	This Act requires federal and state agencies to ensure that actions do not jeopardize the existence of wildlife and their habitat. Where any action by a federal or state agency impounds, diverts, or controls water bodies or streams, that agency must first consult with the U.S. Fish and Wildlife Service, the Department of the Interior, and the California Department of Fish and Game. To the extent such wildlife and habitat are present at the site, this requirement is potentially applicable.	Applicable to All Alternatives but Especially Alt. 3

Table 20 (Continued)
SUMMARY OF POTENTIAL ARARs

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
		POTENTIAL ACTION-SPECIFIC ARARs	
National Pollution Discharge	33 USC 1342 40 CFR 122-125	The CWA regulates the discharge of nontoxic and toxic pollutants into surface water by specific and non-specific sources. In order to meet this requirement, an NPDES permit meeting discharge requirements must be obtained. The general requirements of a permit include (1) development and implementation of a Storm Water Pollution and Prevention Plan; (2) elimination of non-storm water discharge to storm water conveyances; and (3) monitoring of the quality and quantity of storm water discharges. Remedial alternatives proposed for the site could potentially trigger storm water discharge, therefore, these requirements are potentially applicable.	Applicable to All Alternatives but Especially Alt. 3
HWCA	22 CCR 66260 *et seq.*	The HWCA mandates the control of hazardous waste from point of generation through accumulation, transportation, treatment, storage, and ultimate disposal.	Applicable to All Alternatives but Especially Alt. 3 and 4
a. Standards for Generators of Hazardous Waste	22 CCR 66262.10 *et seq.*	This regulation is applicable to hazardous waste resulting from remedial actions that generate hazardous waste on-site.	Applicable to All Alternatives but Especially Alt. 3 and 4
b. Standards for Transporters of Hazardous Waste	22 CCR 66263.10 *et seq.*	This regulation stipulates that hazardous waste must be transported by a hauler registered by the state. To the extent that hazardous wastes are transported for the remedial actions, the requirements are potentially applicable.	Applicable to All Alternatives
Mulford-Carrell Air Resources Act as implemented by the South Coast Air Quality Management Districts (SCAQMD) and administered by the California Air Resources Board (CARB)	H&S Code 39000 *et seq.*	The CARB and local air pollution control districts develop control measures aimed at reducing emissions of identified pollutants. Although it sets no standards, this Act is potentially applicable.	Applicable to All Alternatives
SCAQMD Rules and Regulations a. Permits (1) Permit to Construct	SCAQMD Rule 201	Remedial actions viewed as a "stationary source" by the SCAQMD will require a permit to construct prior to initiating the remedial action.	Applicable to All Alternatives
b. Prohibitory Rules (1) Visible Emissions	SCAQMD Rule 401	This rule limits visible emission from any point source.	During Construction, Applicable to All Alternatives
(2) Nuisance	SCAQMD Rule 402	This rule prohibits the discharge of any material, including odorous compounds that may cause injury, annoyance to the public, property, or business, or may endanger human health, comfort, peace, or safety.	During Construction, Applicable to All Alternatives

Table 20 (Continued)
SUMMARY OF POTENTIAL ARARs

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
POTENTIAL ACTION-SPECIFIC ARARs			
(3) Fugitive Dust	SCAQMD Rule 403	This rule limits on-site activities so that the emissions of fugitive dust from the operation shall not remain visible in the atmosphere beyond the property line of the emission source and the particulate concentration shall not be more that 100 $\mu g/m^3$, averaged over 5 hours, above 15 miles per hour. This rule also requires reasonable precaution to minimize fugitive dust and the prevention and cleanup of material accidentally deposited on paved streets.	Applicable to All Alternatives
(4) Particulate Matter	SCAQMD Rule 404	This rule limits particulate emissions for given volumetric gas flow rates.	Potentially Applicable
(5) Solid Particulate Matter	SCAQMD Rule 405	This rule established allowable discharge rates for particulates.	Potentially Applicable
California Safe Drinking Water and Toxic Enforcement Act of 1986	H&S Code 25249.5 *et seq.* 22 CCR 12000 *et seq.*	This rule regulates discharges and exposures of chemicals known to the State of California to be carcinogenic or reproductive toxins. Warnings are required to be provided to individuals exposed to "significant risks."	Applicable to All Alternatives
California Occupational Safe and Health Act (OSHA)	Labor Code 6300 *et seq.* 8 CCR 330 *et seq.*	This regulation establishes the requirements for worker safety. All employees working at a Superfund or hazardous waste facility must have adequate 40-hour OSHA training in hazardous materials management.	Applicable to All Alternatives
California Safe Drinking Water Act	H & S Code 116270 *et seq.*	The SDWA defines the guidelines for ownership and operations of a public water supply system. The regulations state that no person may operate a public water system without securing a domestic water supply permit from the California Department of Health Services. Procedures and requirements to apply for a new or amended water supply permit are defined under the H & S Code and CCR.	Applicable to All Alternatives but Especially Alt. 4
State Department of Health Services, Sanitation	17 CCR 7100 *et seq.*	These are regulations requiring the water supplier to protect public water supply from contamination.	Applicable to All Alternatives

Table 20 (Continued)
SUMMARY OF POTENTIAL ARARs

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
POTENTIAL ACTION-SPECIFIC ARARs			
State Department of Health Services, Environmental Health	22 CCR 60001 *et seq.*	This regulation establishes the requirements for water permits, domestic water quality monitoring, waterworks standards, surface water treatment, Lead and Copper Rule, drinking water additives, operator certification, and others.	Applicable to All Alternatives
State of California Department of Health Services, Drinking Water Program, Policy 97-005-Guidance Document	Division of Drinking Water & Environmental Management, Policy 97-005	Guidance for Direct Domestic Use of Extremely Impaired Sources. The Policy 97-005 sets forth the position and basic tenets by which the Drinking Water Program evaluates proposals, establishes permit conditions, and approves the domestic use of extremely impaired sources.	Applicable to All Alternatives but Especially Alt. 4
County of San Bernardino, Environmental Health Service, Safe Drinking Water Program	Water Well Construction & Destruction	The County's Safe Drinking Water Program regulates the permitting for water well construction and destruction.	Applicable to All Alternatives
California Department of Water Resources	Bulletin 74-90	Regulates the procedures for drilling and abandoning water wells within the State of California.	Applicable to All Alternatives
American Water Works Association (AWWA)		AWWA provides guidance and procedures for numerous activities, including, but not limited to construction of water facilities and water production and monitoring wells. AWWA standards are referenced in numerous regulations	Applicable to All Alternatives
Santa Ana Regional Water Quality Control Board CAO for Mid-Valley Landfill (R8-2003-0013)		Cleanup and Abatement Order for County of San Bernardino, Solid Waste Management Division, City of Rialto, San Bernardino County	Applicable to All Alternatives
Santa Ana Regional Water Quality Control Board Discharge of Groundwater from Site Clean-up (96-18)	NPDES No. CAG918001	General groundwater cleanup permit for discharges of extracted and treated groundwater resulting from the cleanup of groundwater polluted by petroleum hydrocarbons and/or solvents	Applicable to All Alternatives
Santa Ana Regional Water Quality Control Board Process Water Discharge to Surface Waters (R8-2003-0002)	NPDES No., CAG648001	General Waste Discharge Requirements for Discharges to Surface Waters of Process Wastewater Associated with Certain Wellhead Treatment Systems	Applicable to All Alternatives but Especially Alt. 3
Santa Ana Regional Water Quality Control Board Discharge to Surface Waters (R8-2003-0061)	NPDES No., CAG998001	General Waste Discharge Requirements for Discharges to Surface Waters that Pose an Insignificant (De Minimus) Threat to Water Quality	Applicable to All Alternatives but Especially Alt. 3

Table 20 (Continued)
SUMMARY OF POTENTIAL ARARs

Type/Name of Potential ARAR	Citation	Description and Comments	Potentially Applicable or Relevant And Appropriate
POTENTIAL ACTION-SPECIFIC ARARs			
Santa Ana Regional Water Quality Control Board General Order for Discharges from Clean-up (R8-2003-0085)		Amending Order No. R8-2002-0007, NPDES No. CAG918001, General Groundwater Cleanup Permit for Discharges to Surface Waters of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Petroleum Hydrocarbons, Solvents and/or Petroleum Hydrocarbons mixed with Lead and/or Solvents and Amending Order No. R8-2002-0033, General Waste Discharge Requirements for the Reinjection/Percolation of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Petroleum Hydrocarbons, Solvents and/or Petroleum Hydrocarbons Mixed with Lead and/or Solvents within the Santa Ana Region (see below)	Applicable to All Alternatives Except Alt. 1
Santa Ana Regional Water Quality Control Board Discharge of Groundwater from Site Clean-up (R8-2002-0007)	NPDES No. CAG918001	General Groundwater Cleanup Permit for Discharges to Surface Waters of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Petroleum Hydrocarbons, Solvents and/or Petroleum Hydrocarbons mixed with Lead and/or Solvents	Applicable to All Alternatives but Especially Alt. 3
Santa Ana Regional Water Quality Control Board Discharge of Groundwater from Site Clean-up (R8-2002-0033)		General Waste Discharge Requirements for the re-injection/percolation of extracted and treated groundwater resulting from the cleanup of groundwater polluted by petroleum hydrocarbons, solvents and/or petroleum hydrocarbons mixed with lead and/or solvents within the Santa Ana Region	Applicable to Alt 3 & 4

TABLE 21

Estimated Capital Costs
Alternative No. 1 - Direct Aquifer Treatment

Item	Units	No.	Unit Costs	Subtotal
Inoculant Wells	ft.	26250	$175	$4,593,750
Monitoring Wells	ft.	3150	$150	$472,500
Initial Inoculation	ft.	50	$2,000	$100,000
Subtotal				$5,166,250
Eng. Design	10% Subtotal			$516,625
CM/CQA	10% Subtotal			$516,625
Contingency	15% Subtotal			$774,938
Construction Total				$6,974,438

Estimated Annual O&M
Alternative No. 1 - Direct Aquifer Treatment

Item	HP,total	hrs/d	Unit	No.	Unit cost	Annual Cost
O&M Labor	-	-	hr/mo	40	$75	$36,000
Inoculant Rig	-	-	hr/mo	40	$175	$84,000
Inoculant	-	-	Monthly	50	$1,000	$600,000
Engineering support	-	-	#/month	1	$1,000	$12,000
Subtotal						$732,000
Contingency (15%)						$109,800
Total O&M (per year)						$841,800

System Assumptions
- 2500 ft. well alignment
- 50 Dosing wells (50-foot centers)
- VOCs 20 ppb max.
- Perchlorate 100 ppb max.

TABLE 22

Estimated Capital Costs
Alternative No. 2 - Aquifer Treatment by Recirculating Wells

Item	Units	No.	Unit Costs	Subtotal
Extraction Wells	ft.	3150	$275	$866,250
Extraction Pumps	ea.	6	$30,000	$180,000
Reinjection Wells	ft.	50	$150	$3,937,500
Vaults	ea.	56	$2,000	$112,000
Pipeline Conveyance	ft.	7500	$45	$337,500
Logic Controller	l.s.	1	$50,000	$50,000
Subtotal				$5,483,250
Eng. Design	10% Subtotal			$548,325
CM/CQA	10% Subtotal			$548,325
Contingency	15% Subtotal			$822,488
Construction Total				$7,402,388

Estimated Annual O&M
Alternative No. 2 - Aquifer Treatment by Recirculating Wells

Item	HP,total	hrs/d	Unit	No.	Unit cost	Annual Cost
O&M Labor	-	-	hr/wk	4	$75.00	$15,600
Energy - Extraction Wells	480	24	kWH/d	8,294	$0.10	$302,746
Energy - Treatment	100	24	kWH/d	1,728	$0.10	$63,072
Equipment Maintenance	-	-	#/month	1	$500	$6,000
Inoculant	-	-	#/month	12	$50,000	$600,000
Engineering support	-	-	#/month	1	$1,000	$12,000
Subtotal						$999,418
Contingency (15%)						$149,913
Total O&M (per year)						$1,149,330

System Assumptions
- 6 extraction wells
- 175 to 350 gpm per well
- 2500 ft. well alignment
- 50 reinjection wells (50-foot centers)
- VOCs 20 ppb max.
- Perchlorate 100 ppb max.

TABLE 23

Estimated Capital Costs
Alternative No. 3 - Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Item	Units	No.	Unit Costs	Subtotal
Extraction Wells	ft.	3150	$275	$866,250
Extraction Pumps	ea.	6	$30,000	$180,000
Vaults	ea.	6	$2,000	$12,000
Extraction Conveyance	ft.	10000	$45	$450,000
Logic Controller	l.s.	1	$50,000	$50,000
Treatment Plant	l.s.	1	$950,000	$950,000
Booster Pump	l.s.	1	$20,000	$20,000
Spreading Basin Connection	l.s.	1	$50,000	$50,000
Subtotal				$2,578,250
Eng. Design	10% Subtotal			$257,825
CM/CQA	10% Subtotal			$257,825
Contingency	15% Subtotal			$386,738
Construction Total				$3,480,638

Estimated Annual O&M
Alternative No. 3 - Groundwater Pumping, Above Ground Treatment, Aquifer Recharge

Item	HP,total	hrs/d	Unit	No.	Unit cost	Annual Cost
O&M Labor	-	-	hr/wk	4	$75.00	$15,600
Energy - Extraction Wells	480	24	kWH/d	8,294	$0.10	$302,746
Energy - Treatment System	100	24	kWH/d	1,728	$0.10	$63,072
Equipment Maintenance	-	-	#/month	1	$500	$6,000
Resin Change Out	-	-	#/year	3	$200,000	$600,000
GAC Change Out	-	-	#/year	3	$75,000	$225,000
Engineering support	-	-	#/month	1	$1,000	$12,000
Subtotal						$1,224,418
Contingency (15%)						$183,663
Total O&M (per year)						$1,408,080

System Assumptions
- 6 extraction wells
- 175 to 350 gpm per well
- 2500 ft. well alignment
- 2500 ft. from wells to Plant
- 5500 ft. from Plant to Basin
- CR-3 connection at Plant
- Initial Plant Lease Setup $950,000
- VOCs 20 ppb max.
- Perchlorate 100 ppb max.

TABLE 24

Estimated Capital Costs
Alternative No. 4 - Groundwater Pumping, Above Ground Treatment, Delivery to City's Supply System

Item	Units	No.	Unit Costs	Subtotal
Extraction Wells	ft.	3150	$275	$866,250
Extraction Pumps	ea.	6	$30,000	$180,000
Vaults	ea.	6	$2,000	$12,000
Extraction Conveyance	ft.	5000	$45	$225,000
Logic Controller	l.s.	1	$50,000	$50,000
Treatment Plant	l.s.	1	$950,000	$950,000
Booster Pump	l.s.	1	$20,000	$20,000
Connection to City System	l.s.	1	$50,000	$50,000
Subtotal				$2,353,250
Eng. Design	10% Subtotal			$235,325
CM/CQA	10% Subtotal			$235,325
Contingency	15% Subtotal			$352,988
Construction Total				$3,176,888

Estimated Annual O&M
Alternative No. 4 - Groundwater Pumping, Above Ground Treatment, Delivery to City's Supply System

Item	HP,total	hrs/d	Unit	No.	Unit cost	Annual Cost
O&M Labor	-	-	hr/wk	4	$75.00	$15,600
Energy - Extraction Wells	480	24	kWH/d	8,294	$0.10	$302,746
Energy - Treatment System	100	24	kWH/d	1,728	$0.10	$63,072
Equipment Maintenance	-	-	#/month	1	$500	$6,000
Resin Change Out	-	-	#/year	3	$200,000	$600,000
GAC Change Out	-	-	#/year	3	$75,000	$225,000
Engineering support	-	-	#/month	1	$1,000	$12,000
Subtotal						$1,224,418
Contingency (15%)						$183,663
Total O&M (per year)						$1,408,080

System Assumptions
- 6 extraction wells
- 175 to 350 gpm per well
- 2500 ft. well alignment
- 2500 ft. from wells to Plant
- CR-3 connection at Plant
- Initial Plant Lease Setup $950,000
- VOCs 20 ppb max.
- Perchlorate 100 ppb max.

TABLE 25

SCREENING OF ALTERNATIVE MITIGATION METHODS
PERCHLORATE AND VOC IMPACTS TO GROUNDWATER
RIALTO, CALIFORNIA

	Alternative No. 1 Direct Aquifer Treatment	Alternative No. 2 Aquifer Treatment by Recirculating Wells	Alternative No. 3 Groundwater Pumping, Above Ground Treatment, Aquifer Recharge	Alternative No. 4 Groundwater Pumping, Above Ground Treatment, Delivery to Municipal Supply
Overall Protection VH	Fair 8	Good 12	Very Good 16	Very Good 16
Compliance with ARARs VH	Very Good 20	Good 12	Poor 4	Fair 8
Long-Term Effectiveness VH	Fair 8	Good 12	Very Good 16	Very Good 16
Reduction in Toxicity, Mobility, Volume VH	Poor 4	Good 12	Very Good 16	Very Good 16
Short-Term Effectiveness VH	Poor 4	Fair 8	Very Good 16	Very Good 16
Implementability VVH	Poor 5	Poor 5	Good 15	Very Good 20
Costs VVH	Poor 5	Poor 5	Good 15	Very Good 20
State Acceptance H	Fair 6	Fair 6	Very Good 12	Very Good 12
Community Acceptance H	Poor 3	Poor 3	Very Good 12	Very Good 12
Weighted Total	**63**	**75**	**122**	**136**

Performance Grades
VVG = Very, very good 5 points
VG = Very good 4 points
G = Good 3 points
F = Fair 2 points
P = Poor 1 point

Category Weighting
VVH = Very, very high 5 Multiplier
VH = Very high 4 Multiplier
H = High 3 Multiplier
M = Medium 2 Multiplier
L = Low 1 Multiplier